



Hee that more of thine Excellence would Know
On this thy Book let him some thoughts bestow
Deep Questions in Arithmetick here are
Demonstrated by Rules so plaine so Rare,
Envy it Selfe must needs confess thus much
Read ally Book's ith World you'l find non such
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HODDER'S
ARITHMETICK:
OR, THAT
Necessary ART
Made most Easy.

Being explained in a way familiar
to the Capacity of any that de-
fire to learn it in a little Time.

By James Hodder, Writing-Master.

*The Five and twentieth Edition, Re-
vised, Augmented, and above a Thousand
Faults Amended, by HENRY MOSE,
late Servant and Successor to the Author.*

LONDON: Printed for N. and M. Boddington,
at the Golden-Ball in Duck-Lane; B. Tooke, at
the Middle Temple-Gate in Fleetstreet; D. Mid-
winter at the Three Crowns, and B. Cowse at
the Rose and Crown in St. Paul's Church-
yard. 1714.



TO HIS
REALLY LOVING
AND

Most Worthily Honoured
FRIEND,

JOSIAS DEWYE,
Merchant and Citizen

OF
LONDON:

James Hodder,

In token of true Gratitude for
unmerited Kindnesses,

HUMBLY DEDICATETH

THIS

Manual of Arithmetick.

TO THE
READER.

Having for sundry Years kept a Writing-School in this City, and thereby gained some Experience in that commendable Art, I thought good heretofore to publish somewhat thereof.

And now for the better compleating of Youth, as to Clerkship and Trades, I am induc'd to publish this small Treatise of Arithmetick, which, tho' it be dedicated more particularly to my much honoured Friend; yet being assured he can be content that others should partake of the Benefit thereof, I make bold thus to communicate it.

I need not go about to speak any thing in Praise of Arithmetick, but shall willingly submit what is here treated of to the candid Censure of the most judiciously skilful.

And as I shall condemn no Man's Diligence in what he hath formerly done; so I think none will blame my Endeavours at the present; for tho' I know it is impossible to please every Man, and therefore am not solicitous how to do it; yet, according to the Ability which God hath given me,
I have

TO THE READER.

I have laboured to make a more clear Discovery of some Intricacies in this Art, than to my Knowledge hath hitherto been. Which, tho' perhaps it may not seem to be set out in so gallant a Dress as some others ; yet I dare aver to be done with as much Plainness, Facility, and Shortness, as any that I have yet observed.

Thus, not fearing gentle Reader, lest any Man should scorn my Labours, because I seem to undervalue them, by letting others have the Use, Profit, and Pleasure thereof at so small a Rate, I refer my self, and them, to thy Consideration ; and if after Perusal and Trial made, thou kindly acceptest what I lovingly offer, it shall abundantly satisfy him that is devoted to serve God, and profit others in his Calling, and desires to remain,

Ready to pleasure thee,

whether known, or unknown to

JAMES HODDER.

The

The Corrector to the Reader.

SINCE this Arithmetick came out, it hath sufficiently demonstrated to the World its Utility and facile Method ; and therefore needs no further Commendation than what the Learner (thro' its easy Instructions) may have cause to give it.

And yet, notwithstanding the World hath been fully satisfied with the Method thereof, many have been laid under great Discouragements (some thro' Ignorance blaming the Author) for Multitudes of Faults that have crept in by the Neglect of the Press, and some by pretending to a Perfection in the said Art, before they have attained to it by a Practical Habit.

Now (*Courteous Reader*) thou may'st chearfully go on, all its former Errors being purged from it, and some more Light given to it, being augmented in several Places where Occasion (for thy sake) did require : And that it may answer thy Expectations, is the Desire of him who is a Lover of ingenious Arts.

HENRY MOSE.

To

To my Ingenious Friend Mr. Henry Mose,
upon his Amendments to Mr. James
Hodder's Arithmetick.

THIS Critick Age excludes things obsolete ;
Now nothing takes wanting a Dress compleat.
Beauty, tho' unadorn'd, is Beauty still,
Enrich'd with Splendour, captivates each Will.

So be that wou'd caress this knowing Age,
And means t' appear in Print upon the Stage,
(Ev'n in this Harvest-time, when Learning, Arts,
And Wits are ripe, and the sublimest Parts
Are now arriv'd at what they can aspire,
At which Ages to come may well admire)
Must emulate what hath been done before,
And muster those Acquirements which in store
Lay dormant. This thy Pen hath fully done ;
Th'ast added to his Fame, and to thy own :
For amplifying his elaborate Piece,
Multiplies thy Worth, not subtracting his.
Imbellishing the Work, is to create
A lasting Progeny in despite of Fate.
The Author's Mantle doth envelop thee,
And when the future grateful Age shall see,
That by Accomplishments thou dost inherit
A double Portion of thy Master's Spirit :
Posterity shall make account it owes
To Hodder's Memory, but much more to Mose.

S. HODDER.

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Hodder's

Hodder's ARITHMETICK.

CHAP. I.

The Definition of Number.

A Number is a Multitude of Units put together, as 2, 3, 4, 5, 6, &c. Therefore an Unit is properly no Number, but the Original or Beginning of Number, for it being multiplied or divided by it self, is resolved again into it self, without any Increase-ment or Decrease-ment.

NUMERATION.

Numeration is that Part of Arithmetick whereby one may rightly value, express, and write any Number or Sum propounded.

To the attaining whereof, observe, that all Numbers are express'd by these Characters following, whose simple Value by

B

them-

themselves consider'd, you may here take notice of.

one, two, three, four, five, six, seven, eight, nine, cypher.

1 2 3 4 5 6 7 8 9 0

The Cypher serveth to make up the number of Places, but of it self signifieth nothing.

Every figure hath two values, whereof one is always certain, and hath its own signification; but the other is uncertain, by reason of the uncertainty of the place where it may happen to stand.

A place we commonly call a space in which a figure standeth; and look how many figures there are, so many places there are by which they are valued.

Every Figure in the first place simply betokeneth it self: but in the second Place, which is towards the left hand, it is ten times so much as it was in the Place before, and so increaseth its value according to its place, as you may see in the Table following.

Numeration TABLE.

C. Millions.	X. Millions.	Millions.	C. Thousands.	X. Thousands.	Thousands.	Hundreds.	Tens.	Units.	
9	8	7.	6	5	4.	3	2	1	The first place.
9	8	7.	6	5	4.	3	2	1	987 mil. 654 thou. 321
	9	8.	7	6	5.	4	3	2	98 mil. 765 thou. 32
		9.	8	7	6.	5	4	3	9 mil. 876 thou. 543
			9	8	7.	6	5	4	987 thousand—554
The			9	8.	7	6	5		98 thousand—765
left hand				9.	8	7	6		9 thousand—876
					9	8	7		— 987
						9	8		— 98
							9		— 9

Which you must read beginning from the last Place on the left hand, and proceeding to the first at the right, in this manner, viz. Nine hundred eighty seven Millions, Six hundred fifty four thousand, Three hundred twenty one.

And for the better understanding of the Table, observe that the first figure next the right hand is the place of Units, and signifies but its own single Value;

value ; as the figure of 1 but one, 2 but two, 3 but three, &c. But where two or more figures are joyned together, the figure in the second place towards the left hand betokeneth its own single value ten times ; and so in the third place signifies his own value an hundred times ; in the fourth place a thousand times.

Example. 6. In the fourth place is six thousand, 6 in the third place is six hundred, 6 in the ninth place is six hundred Millions.

And thus you see the value of the figure is according to the place it standeth in.

The names of the places therefore you must be sure to get by heart.

To help you in the expressing of great numbers, you may make a period or prick with your Pen between every three figures, beginning at the right hand ; as in this Example.

123. 456. 789. Here you see is one hundred twenty three, four hundred fifty six, seven hundred eighty nine. Thus you must express all figures : But to know the value of them, you must begin at the right-hand, and reckon towards the left, according to the precedent Table, and you will find

find them to be one hundred twenty three millions, four hundred fifty six thousand, seven hundred eighty nine.

There are three Sorts of Numbers :

1. A Digit.
2. An Article.
3. A mixt or Compound.

All Numbers not exceeding the nine Units are called Digits ; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

Articles are numbers consisting of a Digit and a Cypher ; as 10, 20, 30, 40, 50, 60, &c.

A Compound is a number consisting of both ; as 13, 14, 15, 16, 17, &c.

CHAP. II.

A D D I T I O N.

Without the lesser Denominations.

BEfore I begin to acquaint you with the working of any of the Rules following, I shall (all along in their proper Places) first shew you the nature and meaning of the Rules, and secondly the Manner of their working.

What Addition teacheth.

Addition teacheth you to add two or more Sums together, to make them one whole or total Sum, viz.

Example.

Received at several times these particular Sums following : viz.

At one time	_____	341
At another time	_____	158
More	_____	217
More	_____	596
More	_____	179

I desire to know how } _____
much was received in all } 1491

I. For the working of this, and all others of this kind, you must begin with the first or lowermost figure at your right-hand, saying 9, 6, 7, 8, and 1, makes 31; then set down the 1 in a Line underneath, and carry the 3 unto the next place, where 7, 9, 1, 5, 4, and 3 that I carried make 29, which 9 set down, and carry the 2 unto the next place towards your left-hand, saying, 1, 5, 2, 1, 3, and 2 that I brought make 14, which set down. So that you see all the particulars do make 1491.

A General Rule.

For Sums of one Denomination in Addition,

dition, observe to set down all that is above Ten or Tens, and under Ten: and for every Ten carry one to the next place, until you come to the last, which must always be set down as in the former Example, and this following appeareth.

2734

3945

6542

5763

9278

1712

29974

Here I think it not amiss to advise you to be sure for your clearer working, to set down the figures of every rank in a streight Line under one another; as you see in the foregoing Sums, Units under Units, Tens under Tens, &c.

Addition of Money with the lesser Denominations.

II. I need not here to acquaint you that four Farthings make a Penny, twelve Pence a Shilling, and twenty Shillings a Pound.

But thus much I desire you to mind in all Additions and Subtractions, the Title of your Account, and how many of the first Denomination do make one of the second, and how many of the second do make one of the third, and how many of the third do make one of the fourth ; and so in this manner, if there are more. The Observation of this will much facilitate the Work, and save both you and me a great deal of Labour ; therefore I shall only give one or two Examples of each, cast up to your hands.

For the effecting of this, consider, as before, how many of the first Denomination do make one of the second, (which is here 20 ;) therefore for every 20 Shillings carry one Pound to the Pounds, as thus ; 1, 6, 8, 7, and 1 Shilling is 23 Shillings ; then come down upon the Tens, and say, 23 and 10 is 33, and 10 is 43, and 10 is 53, and 10 is 63, and 10 is 73, and 10 is 83 Shillings : now 83 Shillings being 4 Pound 3 Shillings, set down only the 3 Shillings, and carry 4 to the next, saying, 9, 1, 8, 1, 7, and 4 that I carried in my mind, is 30, set down 0, and carry the 3 to the next, saying, 1, 7, 3, 2, and 3 I carried, is 16 ; set down 6, and carry
1 to

1 to the next, saying, 3, 4, 1, 1, 1, 3, and 1 that I carried, is 14; which by reason there is not any other Place to carry it unto, only set it down according to this Example.

<i>l.</i>	<i>s.</i>
327	11
101	10
100	17
138	18
471	16
319	11
<hr/>	
1460	03

As before, so again consider the Title of your Account, and how many of the one do make the other; then begin with the first Figures at your right-hand, 5, 7, 1, 8, and 1, which being added together make 22, and coming down upon the Tens, say, 22 and 10 is 32, and 10 is 42, and 10 is 52, (and so on if there were more.) Now consider how many Shillings 52 Pence make, *viz.* 4 Shillings and 4 Pence; set down the 4 Pence, and carry the 4 Shillings to the Shillings, saying 4 that I carry, and 8 is 12, and 7 is 19, and 1

B 5

is

is 20, and 3 is 23, and 6 is 29, and 1 is 30; then come down upon the Tens, 40, 50, 60, 70, 80, and 10 is 90 Shillings, which is 4 Pounds 10 Shillings; set down the 10 Shillings and carry the 4 Pounds to the Pounds, saying 4 and 6 is 10, and 1 is 11, and 5 is 16, and 7 is 23, and 1 is 24, which 4 set down and carry the 2 unto the 9, which will make 11, and 4 is 15, and 6 is 21, and 4 is 25, and 1 is 26, and 1 is 27, which set down, and the total amounts to 274 *l.* 10 *s.* 4 *d.* as you may see in this Example.

<i>l.</i>	<i>s.</i>	<i>d.</i>
11	11	11
10	16	08
47	13	10
65	11	11
41	17	07
96	18	05
<hr/>		
274	10	04

You may make a Prick with your Pen at every 4 in the Farthings, and at every 12 in the Pence, and at every 20 in the Shillings. But this way is neither so neat nor commendable; for if you once prick false, you must prick it all over again, which will look

look like so many Blots, and make you more subject to mistake.

Therefore I recommend these two Tables following to you, to be gotten perfectly by heart, before you adventure upon Addition, as one Shilling is 12 pence, 2 Shillings is 24 Pence, and so on.

s.			d.				d.	s.	d.
Note, that	1	— is —	12	Note also, that	20	— is —	1	— 8	
	2	— is —	24		30	— is —	2	— 6	
	3	— is —	36		40	— is —	3	— 4	
	4	— is —	48		50	— is —	4	— 2	
	5	— is —	60		60	— is —	5	— 0	
	6	— is —	72		70	— is —	5	— 10	
	7	— is —	84		80	— is —	6	— 8	
	8	— is —	96		90	— is —	7	— 6	
	9	— is —	108		100	— is —	8	— 4	
	10	— is —	120		110	— is —	9	— 2	
	11	— is —	132		120	— is —	10	— 0	
	12	— is —	144						

The Proof of Addition.

Add all the sums again (except the uppermost) which is here 300 l. 11 s. 6 d. 2 q. and then add the Total thereof unto the said uppermost Line, and if it make the just Sum of the first Total, it is true, otherwise not.

Example.

Example.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>qrs.</i>
	300	11	06	2
	102	15	11	1
	106	17	10	0
	241	18	11	1
	601	11	11	1
	314	10	10	2
	611	11	11	1
Total	2279	19	00	0
	1979	07	05	2
Proof	2279	19	00	0

Addition of Cloth-Measure.

III. Note, That 4 Nails is 1 Quarter of a Yard, 1 Yard 4 Quarters, 1 Ell Flemish 3 Quarters of a Yard, 1 Ell English 5.

You see the Title of your Account is Yards, Quarters, and Nails; now observe how many Nails make one Quarter, which is 4; therefore for every 4 carry 1 Quarter to the Quarters; and likewise for every 4 Quarters, which make a Yard, carry

ry 1 Yard to the Yards
and in the Yards (or last
Denomination of any
Addition) for every 10
carry 1 to the next place,
until you come to the
last Rank ; which Total
set down, as in these Ex-
amples,

Yards. Quar. Na.

371—1—1

106—3—2

410—2—3

716—3—1

151—2—3

171—1—2

412—1—1

601—3—2

912—1—3

3855—1—2

Yds. Qrs. na. El. Eng. qr. na. El. Fl. qrs. na.

31—1—2

47—1—2

54—1—2

27—2—3

16—2—1

14—1—2

31—2—3

31—1—2

16—1—3

41—4—3

91—2—1

35—3—1

17—1—2

31—2—3

27—2—0

38—3—1

27—1—0

226—1—1

153—0—3

203—4—3

156—3—1

Proof—203—4—3

Addition of Wine-Measure.

IV. The same Order, that is set down in the second Section of this Chapter, is here to be observed; and likewise in all the Additions following.

Example.

For 2 Pints carry 1 Quart, for 2 Quarts 1 Pottle, for 2 Pottles 1 Gallon, for 63 Gallons 1 Hoghead, for 4 Hogheads 1 Tun.

Tuns.	hogsh.	gal.	pott.	qr.	pints.
321	—3—	16—	1—	0—	1—
102	—1—	10—	1—	1—	0—
317	—1—	15—	0—	1—	1—
241	—2—	30—	1—	0—	1—
317	—1—	40—	1—	1—	1—
171	—3—	10—	0—	1—	1—
141	—2—	10—	1—	0—	1—
131	—1—	17—	1—	1—	0—
Tot. 1745	—0—	27—	0—	0—	0—
1423	—1—	10—	0—	1—	0—
Pr. 1745	—0—	27—	0—	0—	0—

Ad.

Addition of Troy Weight.

For 24 Grains carry 1 Penny Weight, for 20 Penny Weight 1 Ounce, for 12 Ounces 1 Pound.

lb	℥	pw.	gr.	lb	℥	pw.	gr.
371	—11	—19	—23	41	—10	—17	—10
102	—10	—10	—11	31	—11	—14	—11
413	—11	—16	—10	10	—10	—15	—15
176	—03	—19	—11	11	—11	—11	—10
912	—10	—18	—10	10	—10	—17	—16
341	—11	—13	—22	_____	_____	_____	_____
_____	_____	_____	_____	107	—07	—16	—14
2320	—00	—18	—15	_____	_____	_____	_____

Addition of Averdupoize Weight.

For 16 Ounces carry 1 Pound, for 28 Pounds carry 1 Quarter, for 56 Pounds 2 Quarters, for 84 Pounds 3 Quarters, for 112 Pounds 4 Quarters (or one Hundred Weight) for 20 Hundred 1 Tun.

Exam^s

Example.

C. qrs. lb. 3.	Tuns. C. qrs. lb. 3.
91—3—27—15	91—19—3—17—15
10—1—16—14	16—11—1—11—11
11—2—10—10	91—11—2—11—14
31—1—11—12	60—14—3—10—11
71—1—11—10	31—11—2—11—13
10—3—15—11	78—10—1—13—13
<hr/>	<hr/>
227—02—10—08	41—11—2—11—11
<hr/>	<hr/>

Addition of Dry Measures.

For 16 Pints carry 1 Peck ; for four Pecks
carry 1 Bushel.

Bush. Pec. Pin.	Bush. Pec. Pin.
317—1—10	400—1—10
102—3—11	103—2—10
413—2—10	710—1—11
171—1—11	317—1—10
106—3—10	106—3—11
<hr/>	<hr/>
1112—1—04	

Addition

Addition of Time.

For 60 Minutes carry one Hour, for 24 Hours one Day, and for 365 Days one Year.

Years Days Hours Min.

37—150—11—12

31—110—10—10

14—175—15—23

10—101—11—11

11—137—12—14

10—101—11—13

115—046—23—23

Addition of Long Measure.

For 12 Inches carry 1 Foot, for 3 Feet 1 Yard.

Yards Feet Inches Yards Feet Inches

81—1—10 300—2—11

17—2—11 101—1—10

10—2—07 602—2—11

31—1—10 101—1—10

41—2—11 101—0—08

10—0—10 710—1—11

810—2—10

194—0—11

CHAP. III.

SUBTRACTION,
of Money.

Subtraction teacheth to take any lesser Number out of a greater, and how to know what remains.

I. *Subtraction of one Denomination.*

First set down the greater Number from which you would subtract, and then place the lesser Number to be subtracted under it, as in Addition, with a Line drawn beneath them.

Example, Received——379
Laid out——136
—————

Then take the first figure towards the right hand in the Sum to be subtracted from the figure over it ; as 6 from 9 and there remains 3, which 3 set down ; then 3 from 7 and there remains 4. Lastly, 1 from 3 and there remains 2, which 2 set down.

379
136
—————

And there remains unpaid—243

But

But I shall give you one or two Examples, wherein the figures of the Sum to be subtracted, are some of them greater and some lesser than those you must subtract from; therefore if there be only one Denomination, borrow 10 and add to the upper figure; as in this Example.

Received——130624

Paid out——104146

Remains——026478

Say 6 from 4 I cannot, but 6 from 14 and there remains 8, which set down; 1 that I borrowed and 4 makes 5, 5 from 2 I cannot, but 5 from 12 I may take, and there remains 7; which 7 set down. Then 1 that I borrowed and 1 is 2, 2 from 6 and there remains 4; now 4 from 0 I cannot, but 4 from 10 and there remains 6; then 1 that I borrowed and 0 is 1, now 1 from 3 and there remains 2. Then lastly 1 from 1 and there remains 0.

So that if you take 104146 from 130624 there remains 26478.

II. *Subtraction of several Denominations.*

But if there be several Denominations, then observe, as before in Addition of Money, how many of the first make one of the second, and so on. And if the Figure or Figures be greater than those you are to subtract from, borrow 1 from the next Denomination, and subtract from it; and add the Remains to the upper Figure.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received	275	11	03
Laid out	196	12	05
	<hr/>		
Remains	078	18	10
	<hr/>		

Example. Take 5 *d.* from 3 *d.* I cannot, but 5 *d.* from a Shilling or 12 *d.* and there remains 7 *d.* which added to the 3 *d.* makes 10 *d.*

Again, one Shilling that I borrowed (for you must be sure to pay what you borrow) and 12 is 13, which to take from 11 I cannot; then say 13 *s.* from 20 *s.* and there remains 7, and the 11 makes 18, which set down.

Again,

Again, 1 that I borrowed and 6 is 7; now 7 from 5 I cannot, but 7 from 15, and there remains 8. Then 1 that I borrowed and 9 is 10; now 10 from 7 I cannot, but 10 from 17, and there remains 7, which set down. Then 1 that I borrowed and 1 is 2: 2 from 2 and there remains 0.

	l.	s.	d.
So that	196	12	05
being taken from	275	11	03
there remains	078	18	10

And thus in any other of this nature, observe that the same that you carried in Addition, the same you must borrow in Subtraction: as 12 in the Pence, 20 in the Shillings, and 10 in the last Denomination.

I need say no more, only I shall acquaint you how to know whether your Work be well done or no.

Proof of Subtraction.

Add the Remains to the Sum subtracted, and if it make the same Sum with that which you did subtract, it is true, else not. As in the last Example, 78*l.* 18*s.* 10*d.* and 196*l.* 12*s.* 5*d.* being added, do make the same Sum with the Sum received.

Sub-

Subtraction of Cloth-Measure.

	<i>Yards. qrs. na.</i>	<i>Ells Flem. qrs. na.</i>
Bought	—3712—1—2	Bo.—4171—2—1
Sold	—1913—2—1	So.—1317—2—3
Rem.	—1798—3—1	Rem.—2853—3—2
Proof	—3712—1—2	

	<i>Ells Eng. qrs. na.</i>
Bought	—4716210—2—1
Sold	—1091317—3—3
Remains	—3624892—3—2

Subtraction of Averdupoize Weight.

For the better understanding of the Rule, observe (as you did before) the Title of your Account; and where you cannot take one number out of another, take it out of the next Denomination; as you see here, 12 from 10 I cannot, but 12 Drams from 1 Ounce there resteth 4, and the 10 makes

14; 14 from 11 I cannot, but 14 from 16 and there remains 2; 2 and 11 is 13. Now 1 that I borrowed and 14 is 15; 15 from 11 I cannot, but 15 from 28 and there remains 13; 13 and the 11 is 24. Now 1 that I borrowed, and 3 is 4; 4 from 2 I cannot, but 4 from 4 and there remains nothing, but 2 is 2, which you must set down. Now 1 that I borrowed and 8 is 9; 9 from 7 I cannot, but 9 from 17 and there remains 8. Now 1 that I borrowed and 1 is 2, 2 from 4 and there remains 2.

	<i>C.</i>	<i>qrs.</i>	<i>lb</i>	<i>own.</i>	<i>dr.</i>
Bought	47	2	11	11	10
Sold	18	3	14	13	12
	<hr/>				
Remains	28	2	24	13	14

CHAP. IV.

MULTIPLICATION.

The Multiplication-Table.

2 times	{ 2 }	is	{ 4 }	5 times	{ 5 }	is	{ 25 }
	{ 3 }		{ 6 }		{ 6 }		{ 30 }
	{ 4 }		{ 8 }		{ 7 }		{ 35 }
	{ 5 }		{ 10 }		{ 8 }		{ 40 }
	{ 6 }		{ 12 }		{ 9 }		{ 45 }
3 times	{ 7 }	is	{ 14 }	6 times	{ 6 }	is	{ 36 }
	{ 8 }		{ 16 }		{ 7 }		{ 42 }
	{ 9 }		{ 18 }		{ 8 }		{ 48 }
	{ 3 }		{ 9 }		{ 9 }		{ 54 }
	{ 4 }		{ 12 }				
4 times	{ 5 }	is	{ 15 }	7 times	{ 7 }	is	{ 49 }
	{ 6 }		{ 18 }		{ 8 }		{ 56 }
	{ 7 }		{ 21 }		{ 9 }		{ 63 }
	{ 8 }		{ 24 }				
	{ 9 }		{ 27 }				
5 times	{ 4 }	is	{ 16 }	8 times	{ 8 }	is	{ 64 }
	{ 5 }		{ 20 }		{ 9 }		{ 72 }
	{ 6 }		{ 24 }				
	{ 7 }		{ 28 }				
	{ 8 }		{ 32 }				
6 times	{ 9 }	is	{ 36 }	9 times	9 is 81		
					10 times 10 is 100		

I. For

1. **F**OR the clearer understanding of this Table, observe the Figures in the Margent, 2, 3, 4, &c. and the Word [times] adjoyning to them ; say 2 times 2 is 4, 2 times 3 is 6, 2 times 4 is 8, 2 times 5 is 10, &c. After you know well how to read it within Book, you must of necessity get it very perfectly by heart, before you can make any farther Progress in this Art.

The Use of Multiplication.

Multiplication serveth instead of many Additions, and teacheth of two Numbers given to increase the greater as often as there are Units in the lesser.

There are three things strictly to be observed, viz.

1. The *Multiplicand*, or Sum to be multiplied.
2. The *Multiplier*, or Sum by which you multiply.
3. The *Product*, or Sum produced.

Ask how much is 7 times 52, or in 52 Weeks how many Days there are?

If you should add 7, 52 times it would
C be

be a tedious Work ; but Multiplication will do that at once, which Addition should do at many times ; in Multiplication therefore first set down the greatest Number and the lesser under it, beginning at the right hand, and Multiply every Figure of the Multiplicand, by each Figure of the Multiplier : then (do as in Addition) set down all that is under Ten, or above Ten, or Tens, and for every Ten (or Article) carry one to the next place, and in the last place set down the Tens :

Example.

52 *Multiplicand.*

7 *Multiplier.*

364 *Product.*

Begin with the Multiplier, saying 7 times 2 is 14, set down the 4 under the 2, and carry 1 to the next place saying 7 times 5 is 35, and 1 that I carried is 36, which set down as you see in the Example : so that 7 times 52 is 364.

In 3712 Shillings, how many Farthings ; or how much is 48 times 3712 ;

Be careful in setting the Figures of the Multiplier under the Multiplicand, for
Units

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Units must be under Units, Tens under Tens, Hundreds under Hundreds ; and having rightly placed your Figures, then proceed according to your former Example, saying, 8 times 2 is 16, set down 6, and carry 1 to the next Place, say then 8 times 1 is 8, and 1 that I carried is 9, set down 9, and carry nothing, saying, 8 times 7 is 56, set down 6 and carry 5 to the next Place, saying, 8 times 3 is 24, and 5 is 29, which set down. And having done with the first Figure of the Multiplier, cancel it with a dash of the Pen, and proceed to the next, saying 4 times 2 is 8, which 8 set down directly under the Multiplier, then say, 4 times 1 is 4, which set down, then 4 times 7 is 28, which 8 set down, and carry 2 ; then 4 times 3 is 12, and 2 that I carried is 14 ; which being set down, you shall find 48 times 3712 to be 178176.

3712
48

29696

3712
48

29696

14848

178176

*How to Multiply by 10, 100, 1000,
10000, &c.*

Look how many Cyphers you have in your Multiplier, add them to your Multiplicand, and the Total thereof shall be the Product.

Example.

$$\begin{array}{rcl}
 \text{Multiply} \left\{ \begin{array}{l} 63 \\ 36 \\ 85 \\ 92 \\ 73 \end{array} \right\} & \text{by} & \left\{ \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\} \quad \left\{ \begin{array}{l} \text{facit} \\ 630 \\ 3600 \\ 85000 \\ 920000 \\ 7300000 \end{array} \right\}
 \end{array}$$

How to Multiply by 20, 40, 300, 5000, &c.

As many Cyphers as there are in the Multiplier, set them down towards the right-hand, and multiply the rest as before is taught.

Example.

$$\begin{array}{r}
 37 \\
 20 \\
 \hline
 740
 \end{array}$$

$$\begin{array}{r}
 232 \\
 300 \\
 \hline
 69600
 \end{array}$$

How

How to prove Multiplication.

First cast away the Nines of the Multi-
plicand, (in your former Example) 3712,
saying, 3 and 7 is 10, cast away 9, and there
remains 1; then 1 and 1 is 2, and 2 is 4,
which set on the right side of a Cross, thus :

$$+ 4$$

Then cast away the Nines of the Multi-
plier, saying, 4 and 8 is 12, cast away the 9,
and there remains 3, which place on the left
Side thus :

$$3 + 4$$

Then multiply the one by the other, say-
ing, 3 times 4 is 12, cast away 9 and there
remains 3, which place at the Top of the
Cross, thus :

$$3$$

$$3 + 4$$

Lastly, cast away the Nines of the Pro-
duct, saying, 1 and 7 is 8, and 8 is 16, cast
away 9 and there remains 7; then 7 and 1
is 8, and 7 is 15, cast away 9 and there re-
mains 6; then 6 and 6 is 12, cast away 9
and there remains 3, which place at the Bot-
tom of the Cross, and if the top Figure and
the bottom be alike, your Work may be true.

This is the common way to prove Mul-
tiplication : But the most certain Proof

$$C 3$$

is

is by Division, as hereafter I will shew you.

II. Yet for the more perfect understanding of Multiplication, I have here laid it down in the nature of the *Golden Rule*, which though it be not according to the usual Method of Teaching; yet the Experience I have had thereof sheweth me, that it will inform any one more thoroughly in the nature of this Rule, than any Directions I have yet read; for Tryal hereof take sundry Examples, wrought only by multiplying second and third Numbers together, as these following.

Example.

If 1 Yard cost 17*d.* what cost 40 Yards?

$$\begin{array}{r} 17 \\ \hline 280 \\ 40 \\ \hline \end{array}$$

facit 680 *d.*

If one Pound cost 19*d.* what cost 112 Pound?

$$\begin{array}{r} 19 \\ \hline 1008 \\ 112 \\ \hline \end{array}$$

facit 2128

If

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If 1 Shilling make 12 *d.* what will 20 *s.*?

20

facit 240 *d.*

If 1 Shilling make 48 *qrs.* what will 20 *s.*?

20

facit 960 *Farthings.*

If 1 Crown be 60 *d.* what 500 Crowns?

60

30000 *d.*

If 1 Yard be 16 Nails, what 576 Yards?

16

3456

576

9216 *Nails.*

If 1 Ell *Eng.* make 20 *Na.* what 246 Ells?

20

facit 4920 *Na.*

If 1 Gall. make 8 Pints, what 63 Gallons?

8

facit 504 *Pints.*

If 1 Hogsh. make 63 Gall. what 4 Hogsh.

4

facit 252 *Gallons.*

C 4

If

If 1 Tun make 252 Gallons, what 20 Tun ?

20

facit 5040 Gallons ?

If 1 Inch be 3 Barly-Corns, what 12 Inches?

3

facit 36

If 1 Foot be 12 Inches, what 379 Feet?

12

facit 4548

If 1 Yard be 3 Feet, what 478 Yards ?

3

facit 1434

If 1 Furlong be 40 Poles, what 846 Furlongs?

40

facit 33840

If 1 Mile be 8 Furlongs, what 100 Miles?

8

facit 800

If 1 Pound be 12 Ounces, what 176 Pounds?

12

facit 2112

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If 1 Ounce be 20 Penny-Weight, what 12 Ounces. 20

If 1 Penny-weight be 24 Grains, what 20 Penny-weight. 20

If 1 Pound be 16 Ounces, what 112 Pounds?

16
672
112

If 1 Quarter be 28 Pounds, what 4 Quarters?

4

If 1 C. be 112 Pounds, what 20 C. 20

If 1 Tun be 20 C. what 846 Tuns? 20

16920

If 1 C. gros alloweth 15 Pound Tare,
what will 72 C. gros?

$$\begin{array}{r}
 15 \\
 \hline
 360 \\
 72 \\
 \hline
 \end{array}$$

facit 1080 lb. Tare.

If 1 C. gros give 13 Pound Tare,
what will 96 C. gros give?

$$\begin{array}{r}
 13 \\
 \hline
 288 \\
 96 \\
 \hline
 \end{array}$$

facit 1248

If 1 Dollar be 56 d. what 500 Dollars?

$$\begin{array}{r}
 56 \\
 \hline
 3000 \\
 2500 \\
 \hline
 \end{array}$$

facit 28000 Pence.

If 1 French Crown be 6 s. what 866?

$$\begin{array}{r}
 6 \\
 \hline
 \end{array}$$

facit 5196

If

If 1 lb. cost 37 d. what cost 475 lb. ?

37

3325

1425

facit 17575

CHAP. V.

DIVISION.

DIVISION is that by which we know how many times a lesser Sum is contained in a greater.

The Parts of Division.

In Division observe, $\left\{ \begin{array}{l} 1. \text{ The Dividend.} \\ 2. \text{ The Divisor.} \\ 3. \text{ The Quotient.} \\ 4. \text{ The Remainder.} \end{array} \right.$

1. The *Dividend* is the Sum to be divided.

2. The *Divisor* is the Sum by which we divide.

3. The *Quotient* is the Sum produced, and containing so many times the *Divisor*, as it self is in Value.

4. The

If

4. The *Remainder* is always less than the *Divisor*.

First, Set down the *Dividend*, and right under it towards the left hand the *Divisor*.

Example.

Being to divide 4648 Half-pence by 2, the Number of Half-pence in a Penny.

I first set down the *Dividend*, and then the *Divisor* under the first Figure thus ;

$$\begin{array}{r} 4648 \text{ (} \\ 2 \end{array}$$

But if the Figure or Figures just over the *Divisor*, be less than the Figures under it, the *Divisor* must be removed one Degree or Place more towards the right-hand.

Example.

I would divide 4648 Farthings by 48, the Number of Farthings in a Shilling, then I must set my *Divisor* thus ;

$$\begin{array}{r} 4648 \text{ (} \\ 48 \end{array}$$

And at the end of the two Numbers make a crooked Line wherein to include the *Quotient*, thus (

Yet before you begin your Work, consider three Things, *viz.*

1. Seek how often the *Divisor* is contained in the *Dividend*.

2. Multiply the *Quotient* and *Divisor* together.

3. Sub-

3. *Subtract the Product from the Dividend.*
To propound then the former Example.

In 4648 Half-pence, if I would know how many Pence.

$$\begin{array}{r} 4648 \text{ (2} \\ 2 \end{array}$$

I must seek how many times 2 is contained in 4, which is twice ; then I set 2 in the Quotient, and multiply it by the Divisor, saying 2 times 2 is 4 ; now 4 from 4 and there remains nothing ; which 2 having performed its first Office, I cancel with a dash of the Pen, and remove it one place nearer the right-hand, thus ;

$$\begin{array}{r} 4648 \text{ (23} \\ 22 \end{array}$$

Then I say again, how many times 2 in 6, which is 3 times ; I set down 3 in the Quotient, and Multiply by 2, saying, 3 times 2 is 6 ; now 6 from 6, and there remains 0.

Again I remove the Divisor, thus,

$$\begin{array}{r} 4848 \text{ (23} \\ 222 \end{array}$$

and

and try how many times 2 in 4, which is two times, therefore I set 2 in the *Quotient*, and Multiply it by 2 (the Divisor) saying, 2 times 2 is 4, now 4 from 4, and there remains 0.

$$\begin{array}{r} 4648 \quad (232 \\ 222 \end{array}$$

Again, I remove the Divisor, and try again how often 2 is contained in 8, which is 4 times, I set 4 in the *Quotient* and multiply it by 2, saying, 4 times 2 is 8 : now 8 from 8, and there remains 0.

$$\begin{array}{r} 4648 \quad (2324 \\ 2222 \end{array}$$

Another Example with one Figure.

Suppose there is 398 Pounds to be equally divided between 6 Men, the Demand is what each Man must have ?

First, I set down the Dividend 398, and 6 (the Divisor) under the 9 thus, because I cannot take 6 out of 3.

$$\begin{array}{r} 398 \quad (6 \\ 6 \end{array}$$

Then I try how many times 6 I can have in 39, which is 6 times, I place 6 in

in the Quotient beyond the crooked Line, saying, 6 times 6 is 36; now 36 from 39, and there remains 3, which I set down over the 9, and cancel the 39 and 6 my Divisor, thus,

$$\begin{array}{r} 3 \\ 39 \overline{) 86} \\ \underline{6} \end{array}$$

Again, I remove my Divisor to the next Place under 8, and seek how many times 6 I can have in 38, which is also 6 times, I set 6 in the Quotient, saying, 6 times 6 is 36, 36 from 38, and there remains 2, which 2 I set over the 8, and cancel the 6 thus;

$$\begin{array}{r} 3 \ 2 \\ 39 \overline{) 866} \\ \underline{66} \end{array}$$

So that every Man must have 66 $\text{\textit{l.}}$ and 2 $\text{\textit{l.}}$ over, which I may turn into Pence, and divide also by 6, and the Quotient will be 80 Pence, which is in all 66 Pound 6 Shillings and 8 Pence a-piece.

This Order I observe to divide by one Figure, but if the Divisor do consist of more Figures than one, I must take the first Figure of the Divisor no oftner out of the Dividend than

then I can also take all the rest of the Divisors out of the Dividend that stands above them, as in the Examples following may appear.

But before you proceed to divide by 2 Figures or more, be careful to understand well how to divide by one.

How to prove Multiplication.

In Multiplication I told you, that the most certain Proof for that Rule, was by Division; I shall therefore take the Product of one of the Multiplications before going, and divide it by the Multiplier thereof, to try the former Work; as for Example.

I would divide 178176 by 48, which was one of the former Products in Multiplication, which Numbers place as in the Example following.

$$\begin{array}{r} 178176 \text{ (} \\ 48 \end{array}$$

First I seek how many times 4. is contained in 17, which I find 4 times; now 4 times 4 is 16; 16 from 17, and there remains 1, which makes the 8 to be but 18; now 4 times 8 is 32; 32 from 18 I cannot, therefore 4. times is too much.

2, I seek whether 3 times will do it, saying, 3 times 4 is 12; now 12 from 17, and there remains 5, which makes the 8 to be 58; then I say 3 times 8 is 24: now 4 from 8, and there remains 4, then 2 that I carried from 5, and there remains 3.

$$\begin{array}{r} 3 \\ 84 \\ \times 78176 \quad (3 \\ 48 \end{array}$$

3. I remove the Divisor one place nearer the right Hand, saying, how many times 4 in 34, which is 7 times (because 9 or 8 times are too many) then 7 times 4 is 28; now 28 from 34, and there remains 6; then 7 times 8 is 56; 6 from 1 I cannot, but 6 from 11, and there remains 5; Then 5 I carry'd, and 1 I borrowed is 6, now 6 from 6, and there remains 0.

$$\begin{array}{r} 36 \\ 845 \\ \times 78176 \quad (37 \\ 488 \\ 4 \end{array}$$

Again, I remove the Divisor, saying,
how

how many times 4. in 5, which is once ; then I say once 4 is 4. Now 4 from 5 and there remains 1. Then once 8 is 8 ; now 8 from 17, and there remains 9, and 1 that I borrowed from 1, there remains nothing.

$$\begin{array}{r}
 36x \\
 8459 \\
 x78x76 \text{ (371} \\
 4888 \\
 44
 \end{array}$$

Again, I remove the Divisor, and seek how many times 4 is in 9, which is twice saying, 2 times 4 is 8 ; now 8 from 9 and there remains 1 ; Then 2 times 8 is 16 ; now 16 from 16, and there remains nothing. So that I find the Quotient to be 3712, the same as the Multiplicand was in the Multiplication, which is a most certain Proof of that Rule.

How to prove Division.

$$\begin{array}{r}
 36xx \\
 8489 \text{ (0} \\
 x78x76 \text{ (3712} \\
 48888 \quad 48 \\
 444 \quad \text{---} \\
 29696 \\
 14848 \\
 \text{---}
 \end{array}$$

Proof—178176

And

And as Division is a sure Proof of Multiplication ; so Multiplication is the surest Proof of Division, which is performed by multiplying the Quotient with the Divisor ; and if the Product thereof be the same with the Dividend, your Division is well wrought, otherwise be sure some Error is committed in your Work.

Also if any Figures remain after your Division is ended, they must be added to the Product of your Multiplication, according to their several Places, and then (if true) the Total will be likewise the same with the Dividend ; as, for Example, doth appear in the last Sum of this Rule.

A more easie way of Division, and with fewer Figures.

There are 4648 Shillings to be equally divided betwixt 34 Men : I demand what is each Man's Proportion ?

I will not stand to shew you more of this common way of Division, which is indeed very tedious and burthensome to the Memory, and hath caused (to my Knowledge) many to despair of attaining of it, and so of pro-

proceeding further in this Art. But proceed by the Method following, which will enable one to go on with far more ease and delight than commonly is seen.

The Question being stated is to be set thus.

$$\begin{array}{r} 4684 \text{ (} \\ 34 \end{array}$$

Wherein consider how often 34 is contained in 46, which is once (or rather see first how often 3 is contained in 4, which likewise is once) then set 1 in the Quotient, saying, once 4 is 4; now 4 from 6, and there remains 2; which 2 set directly over its Dividend.

$$\begin{array}{r} 12 \\ 4634 \text{ (1} \\ 34 \end{array}$$

Then go backward to the next, saying, once 3 is 3, 3 from 4 and there remains 1, which also set over the 4, and cancel it, and 3 the Divisor, with a dash of the Pen, as you see in the Example.

Then remove the Divisors one Degree further towards the right hand, thus:

$$\begin{array}{r} 12 \\ 4684 \text{ (1} \\ 344 \\ 3 \end{array}$$

Then

Then consider how often 3 is contained in 12, which is 4 times ; but 4 times the next Divisor cannot be taken out of 8, and you must never take one of the Divisors oftner than you can take all the rest ; seeing then 4 times is too much, try (in your Mind) whether each Divisor can be taken 3 times, if so, then place 3 in the Quotient, saying, 3 times 4 is 12, 12 from 8 I cannot, but 12 from 18 and there remains 6 ; then 3 times 3 is 9, and 1 that I carried is 10, 10 from 12 and there remains 2.

Again, remove your Divisor towards your right hand : thus,

$$\begin{array}{r}
 2 \\
 \cancel{12}6 \\
 \cancel{48}84 (13 \\
 \cancel{3444} \\
 33
 \end{array}$$

Then consider how often three is contained in 26, which is 8 times, and 8 times 3 is 24 ; now 24 from 26, and there remains 2, which 2 will make the next Figure to be but 24 ; then 8 times 4 is 32, 32 out of 24 cannot be, and

and therefore say 8 times is too much, which seeing so: try (in your mind) whether 7 will do it, saying 7 times 4 is 28; 28 from 4 I cannot, but 28 from 34, and there remains 6. Then 7 times 3 is 21, and 3 that I carried is 24; 24 from 26, and there remains 2. Cancel out the Dividend and Divisor, and set the remains over head; and your Work is done.

$$\begin{array}{r}
 2 \ 2 \\
 \times 28 \ 6 \\
 \hline
 4684 \ 137 \\
 3444 \\
 \hline
 33
 \end{array}$$

The *Quotient* sheweth that 34 Men must have 137 Shillings a Piece, and 26 Shillings over and above to be divided amongst them.

Which Remainders, and all others of any Division, I shall shew you what they are when you practice Fractions, as the place more convenient and proper.

4 Example.

There is a Ship taken by 346 Seamen, which is valued at 87654 l. to be equally divided

vided amongst them, I demand what each Man must have?

$$\begin{array}{r} 87654 \text{ (} \\ 346 \end{array}$$

Consider how many times 346 is contained in 876, which is two times, or rather how often 3 is contained in 8, which is likewise 2 times; set 2 in the Quotient, and say, 2 times 6 is 12; 12 from 16 I cannot, but 12 from 16 and there remains 4.

Then 2 times 4 is 8, and 1 that borrowed is 9; 9 from 18 4
7 I cannot, but 9 from 17, and 87654 (2
there remains 8. Then 2 times 346
3 is 6, and 1 is 7; 7 from 8,
and there remains 1. Then having done
with the Divisors, remove them to the
next place towards the right hand; thus,

Then say, how many times
3 in 18? 6 times, but that 184
being too much, (because all 87654 (2
the rest cannot be taken so 3466
often) therefore say, 5 times 34
6 is 30; 30 from 35 I cannot,
but 30 from 35, and there re-
mains 5.

Then 5 times 4 is 20, and 3 that I borrowed

rowed is 23 ; 23 from 4 I cannot, but 23 from 24 and there remains 1.

$$\begin{array}{r}
 11 \\
 1845 \\
 87684 \text{ (25)} \\
 3466 \\
 34
 \end{array}$$

Then 5 times 3 is 15, and 2 that I borrowed is 17 ; 17 from 18 and there remains 1.

Again, remove the Divisors (pondering in your Mind) how many times 3 can I have in 11, three times ; by which I perceive 3 will do it, therefore place it in the Quotient, saying 3 times 6 is 18 ; 18 from 4 I cannot, but 18 from 24, and there remains 6 : Then 3 times 4 is 12, and 2 that I carried is 14 ; 14 from 5 I cannot, but 14 from 15 and there remains 1 : Then 3 times 3 is 9, and 1 that I carried is 10 ; 10 from 11, and there remains 1.

$$\begin{array}{r}
 (1 \\
 11 \text{ (1)} \\
 1848 \text{ (6)} \\
 87684 \text{ (253)} \\
 34666 \\
 344 \\
 3
 \end{array}$$

5 Example.

There is a City taken in the Wars by 9034 Soldiers, that is worth 7306242 l. I demand what each Soldier must have?

$$\begin{array}{r} 7306242 \\ 9034 \end{array}$$

Here you see that 9034 cannot be contained in 7306; therefore remove your Divisor to the next Place towards the right hand, thus:

$$\begin{array}{r} 7306242 \\ 9034 \end{array}$$

I. Consider how many times 9 can be had in 73, which is 8 times; place 8 in the Quotient, saying, 8 times 9 is 72, 72 out of 73 I cannot, but 72 out of 73 and there remains 1.

Then 8 times 0 is 0, and 3 that I borrowed is 27; 27 from 73 I cannot, but 27 from 73 and there remains 46.

Then 8 times 6 is 48, but 3 that I carried is 3, 3 from 10 and there remains 7.

$$\begin{array}{r} 790 \\ 7306242 \\ 9034 \end{array}$$

Then 8 times 9 is 72, and 1 that I borrowed is 73; 73 from 73, and there remains 0.

D

Again,

Again, remove your Divisor.

Here you also see, that 9034, the Divisor, cannot be taken out of the Dividend; therefore cancel it, and remove it to the next Place, setting a Cypher in the Quotient.

$$\begin{array}{r}
 790 \\
 7306242 \quad (80 \\
 90344 \\
 903
 \end{array}$$

Then try again how often the Divisor is contained in the Dividend, which is 8 times.

Then say, 8 times 4 is 32; 32 out of 2 I cannot, but 32 out of 32, and there remains 0.

Then 8 times 3 is 24, and 3 that I borrowed is 27; 27 from 4 I cannot, but 27 from 34, and there remains 7.

$$\begin{array}{r}
 (6 \quad (7 \\
 790 \quad (7 \quad (0 \\
 7306242 \quad (808 \\
 903444 \\
 9033 \\
 90
 \end{array}$$

Then 8 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10, and there remains 7.

Then

Then 8 times 9 is 72, and one that I borrowed is 73 ; 73 from 79, and there remains 6. So that every Soldier must have for his Share 808 Pounds.

6 Example.

What is the Quotient of 56037478, divided by 2306803 ?

Consider how often the Divisor is contained in the Dividend, which is here twice.

$$\begin{array}{r} 990141 \\ 2306803 \overline{) 56037478} \quad (2 \\ 2306803 \end{array}$$

Then say, 2 times 3 is 6, 6 from 7, and there remains 1.

Then 2 times 0 is 0 ; 0 from 4, and there remains 4.

Then 2 times 8 is 16 ; 16 from 17 I cannot, but 16 from 17, and there remains 1.

Then 2 times 6 is 12, and 1 that I borrowed is 13 ; 13 from 3 I cannot, but 13 from 23, and there remains 0.

Then 2 times 0 is 0, but 1 that I borrowed is 1 ; 1 from 0 I cannot, but 1 from 10, and there remains 9.

D 2

Then

Then 2 times 3 is 6, and 1 that I borrowed is 7: 7 from 6 I cannot, but 7 from 16 and there remains 9.

Then 2 times 2 is 4, and 1 that I borrowed is 5: 5 from 5, and there remains nothing.

Remove the Divisor.

Again, Consider how many times the Divisor is contained in the Dividend, which is 4 times.

$$\begin{array}{r}
 67420 \\
 9901416 \\
 86037478 \quad (24 \\
 23088033 \\
 230880
 \end{array}$$

Then say, 4 times 3 is 12; 12 from 8 I cannot, but 12 from 18 and there remains 6.

Then 4 times 0 is 0, but one that I borrowed is 1; 1 from 1 and there remains 0.

Then 4 times 8 is 32; 32 from 4 I cannot, but 32 from 34 and there remains 2.

Then 4 times 6 is 24, and 3 that I borrowed is 27; 27 from 1 I cannot, but 27 from 31 and there remains 4.

Then

Then 4 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10, and there remains 7.

Then 4 times 3 is 12, and 1 that I borrowed is 13; 13 from 9 I cannot, but 13 from 19, and there remains 6.

Then 4 times 2 is 8, and 1 that I borrowed is 9; 9 from 9, and there remains 0: So that the Quotient is 24, or the Divisor is contained in the Dividend 24 times.

Having laid down the latter Part of the former Rule in the nature of the Rule of Three, and apprehending it very necessary for young Learners, I shall therefore observe the same here in Division, which is performed by dividing the second Number by the first, and the Quotient is the Answer to the Question.

If 63 Gallons make 504 Pints, what 1 Gallon?

$$\begin{array}{r} 804 \text{ (8 Pints.)} \\ 63 \end{array}$$

If 4 Hogheads make 252 Gallons, what 1 Hoghead?

$$\begin{array}{r} 252 \text{ (63 Gallons.)} \\ 44 \end{array}$$

D 3

If

If 20 Tuns make 5040 Gallons, what 1 Tun?

\times

8040 (252 Gallons.

2220

If 72 C. gross allow 1080 Pound for Tare, what must 1 C. allow?

36

1080 (15 Pounds facit.

722

7

If 152 C. cost 760 Pounds, what 1 C?

760 (5 Pounds facit.

152

If 500 Dollars be 28000*d.* what 1 Dollar?

3

28000 (56 Pence facit.

500

As in Multiplication, when the Multiplier is 10, 100, 1000, &c. you add to the Multiplicand on the right hand so many Cyphers as are in the Multiplier, to make the Product; so in Division, when the Divisor is 10, 100, 1000, &c. you must cut off so many Figures from the Dividend to the right hand (with a perpendicular Line) as there are Cyphers in the Divisor, and the Figures to the left hand are the Quotient. Divide 375900 by 10, or 100, &c.

Quot. 37590|0

Quot. 3759|00

I shall

I shall not (I hope) need to trouble my self, or Learner, to shew the Working of this Sum, or any other, having now (as I suppose) sufficiently treated of Division; but will leave it to the Censure of the most experienc'd to judge, whether this Manner of Dividing be not plain, lineal, and to be wrought with fewer Figures than any which is commonly taught: As for Example appeareth.

(8
 97 (5
 9863 (0
 987829 (3
 98764181 (0
 9876820809 (8
 987684198987 (6
 49382714848763 (4
 2469138788376843 (2
 123456789987654321 (124999999
 9876543210 (987654321
 9876543222222222 (124999999
 98765433333333 (2499999982
 987654444444 (3749999974
 9876555555 (4999999966
 9876566666 (6249999958
 89765666 (7499999940
 98777 (8749999938
 988 (9999999920
 9 (11249999915
 8

Proof 123456789987654321

D 4

CHAP.

CHAP. VI.

REDUCTION.

I. **A**S for *Reduction*, though it be no Rule absolute of it self, but meerly wrought by Multiplication and Division (as I have here manifested in a plain manner) yet I think good not (altogether) to omit it, lest any should censure me for so doing, in regard it is very usually practised : To deliver somewhat therefore concerning it.

Reduction teacheth one to bring all gross or great Denominations into small, and small into great.

First, All great Denominations are brought into small by Multiplication ; as,

Pounds multiplied by 20, are Shillings.

Shillings multiplied by 12, are Pence.

Pence multiplied by 2, are Half-pence.

Pence multiplied by 4, are Farthings.

Pounds multiplied by 240, are Pence.

Pounds multiplied by 480, are Half-pence.

Pounds multiplied by 960, are Farthings.

Secondly,

Chap. VI. *Reduction.*

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Secondly, All small Names are brought into great by Division; as,

Shillings divided by 20, are Pounds.

Pence divided by 12, are Shillings.

Half-pence divided by 2, are Pence.

Farthings divided by 4, are Pence.

Pence divided by 240, are Pounds.

Half-pence divided by 480, are Pounds.

Farthings divided by 960, are Pounds.

$$\begin{array}{r}
 1000 \\
 20 \\
 \hline
 20000 \text{ s.} \\
 12 \\
 \hline
 240000 \text{ d.} \\
 4 \\
 \hline
 960000 \text{ q.}
 \end{array}$$

1. Consider whether the Sum propounded be to be brought into a greater or lesser Denomination.

2. Consider how many of the one can make the other; as here, how many Shillings can make a Pound, viz. 20; and contra how many Shillings a Pound makes, viz. 20.

D 5

There

Therefore of necessity there must be 20 times so many, which being multiplied by 5, make 20000 Shillings, and 12, 240000 Pence, and by 4, *facit* 960000 Farthings; as in the Example.

In 960000 Farthings, how many Pence, Shillings, and Pounds?

$$\begin{array}{r}
 \times \\
 960000 \quad (940000 \quad (2000|0s. \\
 444444 \quad (222222 \quad 1000 \text{ l. } \textit{facit}. \\
 \hline
 XXXX
 \end{array}$$

To bring Shillings into Pounds (or to divide by 20) cut off the first Figure towards the right hand with a dash of the Pen, and take half of the remaining Figures.

In 8471213 Farthings, how many Pence, Groats, and Nobles?

$$\begin{array}{r}
 33 \quad (1 \quad 232 \quad (1 \\
 8471213 \quad 211780 \quad (3 \quad (52945|0 \\
 444444 \quad 44444 \quad 4 \quad \textit{facit} \quad 26472 \text{ Nobles.}
 \end{array}$$

Here

Here you see the Sum is to be brought into a greater Denomination than it self, which is therefore to be done by Division.

Then you are to consider what your Divisor must be, which is here 4, because 4 Farthings make a Penny; and as often as 4 is contained in the said Sum, so many Pence there are.

Your Farthings then being brought into Pence, consider the next Denomination what it is, and how many of the former make one of it; as how many Pence make a Groat, viz. 4; and look how many times 4 is contained in the Sum, so many Groats there are.

Having brought the Pence thus into Groats, endeavour to bring them into Nobles, by considering how many Groats make a Noble, viz. 20; therefore divide by 20 (by cutting off the first Figure towards the right hand, and taking the half of the rest) and your Quotient will be Nobles.

I shall say no more as to Reduction of Money, only leave two or three Questions for the Learner to practise upon.

In 100 l. how many Farthings, Pence, Shillings, Three-pences, and Nine-pences?

In 47162 Marks, how many Nobles,
Pounds, Groats, Farthings, 6 d. and 2 d.?

In 7665 l. 11 s. 10 d. how many Shillings,
Pence and Pounds, Farthings, Crowns, and ob.

Reduction of Cloth Measure.

II. Observe in this and all the Reductions following, how many of the one Denomination do make one of the other, and so multiply or divide according to the two Rules aforegoing, in Reduction of Money.

In 4372 Yards, how many Qrs. and Ells
Flem. 4

17488 Qrs.

202 (1

17488 (5829 $\frac{1}{2}$ facit.

3333

In 7862 Ells Eng. how many Qrs. and Yards?

5

39310 Qrs.

323 (2

39310 (9827

4444

In 85 Pieces, each 19 Ells $\frac{3}{4}$, how many
Qrs, Nails, and Yards? Re-

Reduction of Wine-Measure.

III. In 35 Tuns, how many Hogheads, Gallons, Pottles, Quarts, and Pints?

$$\begin{array}{r}
 35 \\
 \underline{4} \\
 140 \text{ Hogsh.} \\
 \underline{63} \\
 420 \\
 \underline{840} \\
 8820 \text{ Gallons.} \\
 \underline{4} \\
 35280 \text{ Quarts.} \\
 \underline{2} \\
 70560 \text{ Pints.}
 \end{array}$$

In 4712568 Pints, how many Gallons and Rundlets, each Rundlet 11 Gallons?

In 327 Barrels, each 32 Gallons, how many Hogheads and Tuns?

Reduction of Time.

IV. In 1659 Years, how } 365 Days a Year,
 many Days, Hours, } 24 Hours a Day.
 and Minutes ? } 60 Min. an Hour.

1659 Years.

365

8295

9954

4977

605535 Days.

24

2422140

1211070

14532840 Hours.

60

871970400 Minutes.

In 87167155 Minutes, how many Hours,
 Days, and Years ?

In 20 Years and an half, how many Days,
 Hours, and Minutes ?

Re-

Reduction of Land Measure.

In 100 Miles, how
 many Furlongs,
 Poles, Feet, In-
 ches, and Bar-
 ley-corns?

8 Furlongs a Mile.
 40 Poles a Furlong.
 16 $\frac{1}{2}$ Feet a Pole.
 3 Feet a Yard.
 12 Inches a Foot.
 3 Barley-corns an Inch.

100 Miles.

8

800 Furlongs.

40

32000 Poles.

33

96000

96000

 $\frac{1}{2}$ 1056000 Half Feet.

528000 Feet

12

6336000 Inches.

3

19008000 Barley-corns.

Re-

Reduction of Troy-Weight.

VI. In 87 Pound and $\frac{1}{2}$, how many Ounces, Penny-weights, and Grains?

$$\begin{array}{r}
 87 \text{ lb. } \frac{1}{2} \\
 12 \\
 \hline
 174 \\
 876 \\
 \hline
 1050 \text{ } \frac{3}{4} \\
 20 \\
 \hline
 21000 \text{ Pw.} \\
 24 \\
 \hline
 84000 \\
 42000 \\
 \hline
 504000 \text{ Grains.}
 \end{array}$$

In 7151213 Grains, how many Penny-weights, Ounces, and Pounds?

In 15 Ingots, each 7 Pound and $\frac{1}{2}$, how many Ounces, Penny-weights, and Grains?

Re-

Reduction of Averdupoise Weight.

VII. In 96 C. Weight, how many Qrs. lb.

4

and 3?

384 *Quarters.*

28

3072

768

10752 *Pounds.*

16

64512

10752

172032 *Ounces.*

In 40 C $\frac{1}{2}$ 19 Pounds 11 Ounces, how ma-

4

(ny Qrs. lb. and 3.

162 *Quarters.*

28

1305

325

14555 *Pounds.*

16

27331

4556

72891 *Ounces.*

In

In 8714 Ounces, how many Pounds, Qrs. and C?

In 20 Bags, each 3 C $\frac{1}{2}$, how many Qrs. and Pounds?

4

14

28

112

28

392 Pounds in one.

20

7840 Pounds in all.

Where you find the Word [each] have a special regard to it, and reduce the Particulars which it implieth, first into one Denomination; then, when you know how much is contained in one, you may easily know how much is in all.

In 36 Barrels of Figs, each 3 C. $\frac{1}{4}$ gross, Tare 19 Pounds per Barrel, how many Pounds neat?

Whether the Word [Tare] imply per Bag, per Barrel, or per C. &c. it is all one, if you keep to your former Rule in Multiplication, by observing which you cannot miss of what you would know: as here Tare 19 Pounds per Barrel.

Say, If 1 Barrel give 19 Pounds, what 36 Barrels? Mul-

Chap. VI.

Reduction.

Multiply 19 and 36 together, and the Product is Pounds Tare ; then subtract the Pounds Tare from the Pounds Gross, and the Remains are Pounds Neat.

<p>36 Barrels.</p> <p>19 Tare for 1 Barrel.</p> <hr style="width: 100%;"/> <p>324</p> <p>36</p> <hr style="width: 100%;"/> <p>684 Tare in all.</p>	<p>3 C $\frac{1}{2}$</p> <p>4</p> <hr style="width: 100%;"/> <p>13</p> <p>28</p> <hr style="width: 100%;"/> <p>104</p> <p>26</p> <hr style="width: 100%;"/> <p>364 lb. in 1 Bar.</p> <p>36</p> <hr style="width: 100%;"/> <p>2184</p> <hr style="width: 100%;"/> <p>13104 lb. gross.</p> <p>684</p> <hr style="width: 100%;"/> <p>12420 lb. neat.</p>
--	--

In 45 Bags of, &c. each 17 C $\frac{1}{2}$ gross,
Tare 15 Pounds per Bag, how many C. neat ?
In 47 C. $\frac{1}{2}$ gross, Tare 17 Pounds per C,
how many Pound neat ?

In

In 5 Hogsheads of Tobacco, each containing as followeth, how many C. neat?
viz.

		C. qrs. lb.		lb.
Number	$\left. \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} \right\}$ containing	4-2-11	Tare	63
		3-1-12		72
		2-3-16		56
		4-1-20		75
		3-2-27		64

In 57120, C $\frac{1}{2}$ of Lead, how many Fother at 19 C $\frac{1}{2}$?

In 5671 Pigs of Lead, each 7 C $\frac{1}{2}$, how many Fother at 19 C $\frac{1}{2}$?

Facit 2181 Fother $\frac{11}{19}$.

CHAP. VII.

Numeration of Fractions.

THE next Things to be treated of, are Fractions:

Concerning which, I shall shew,

1. What a Fraction is.
2. How it is express'd.
3. How many sorts of Fractions there are.

Chap. VII. Numeration of Fractions. 69

A Fraction or broken Number is a Part or many Parts of a whole Number : For as whole Numbers take their beginning from One, and continue in Number without end ; so the said whole Numbers by Imagination may be dissolv'd or broken into Pieses or Parts Infinite.

Therefore to attain the knowledge of them, acquaint your self with these two Terms, *Numerator* and *Denominator*.

The *Numerator* expresses the Number of the Parts.

The *Denominator* giveth those Parts their Names.

$\frac{1}{2}$ Numerator.

$\frac{2}{3}$ Denominator.

Proper Fractions. $\left\{ \begin{array}{l} \frac{1}{2} \text{ is the one half of any thing.} \\ \frac{2}{3} \text{ is two third parts of any thing.} \\ \frac{3}{4} \text{ is three quarters of any thing.} \\ \frac{4}{5} \text{ is four five parts of any thing.} \end{array} \right.$

Fractions of Fractions.

Fractions of Fractions have commonly this Word (of) between them, as $\frac{2}{3}$ of $\frac{3}{4}$, that is, two thirds of three quarters.

Improper Fractions.

If the *Numerator* be greater than the *Denominator*, the *Fraction* is improper, and containeth an Unit or Units, or some Part or Parts of the *Denominator*, as $1\frac{3}{4}$ is three Integers or wholes, and three quarters; but when the *Numerator* and the *Denominator* are alike, they make an Unit.

Though *Addition* in whole Numbers be immediately after *Numeration*; yet in *Fractions* it is not so, because there are, as here you see, *Fractions* of several Sorts, which must of necessity be reduc'd into one Denomination, before they can be added. Therefore, to avoid Disorder, I shall first shew what this Reduction of Fractions is; secondly, how to reduce all Fractions to one Denomination or Likeness.

CHAP. VIII.

REDUCTION of FRACTIONS.

What Reduction is.

Reduction teaches to bring Integers into Fractions, or contrary; yea, Fractions of divers Denominations into one, or what you list.

Ch. VIII. *Reduction of Fractions.* 71

I would have reduc'd $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$ of an Ell, or what you please, into one Denomination.

To reduce proper Fractions.

For the effecting of this, and all other of this kind, multiply all the Denominators together (which Product take for a common Denominator) as 2 times 3 is 6, and 4 times 6 is 24, your Denominator.

Then multiply the Numerator of the first in all the other Denominators, except its own Denominator ; as once 3 is 3, 3 times 4 is 12, which take for a new Numerator to the first Fraction.

Then multiply the second Numerator in all the Denominators except its own ; as 2 times 2 is 4, and 4 times 4 is 16, which likewise take for a new Numerator to the second.

Then multiply the third Numerator in all the Denominators except its own ; as 3 times 3 is 9, 2 times 9 is 18, which also place for a new Numerator to the Third, and your Work standeth thus :

$$\begin{array}{r} \frac{12}{2} \quad \frac{16}{3} \quad \frac{18}{4} \\ \hline 24 \end{array}$$

So that — $\frac{12}{24}$ $\frac{16}{24}$ $\frac{18}{24}$
are equal to $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$

II. To

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II. *To reduce Fractions of Fractions into one Denomination.*

Multiply all the Numerators together, and take the Product thereof for a new Numerator; and likewise multiply all the Denominators together, and make the Total a Denominator.

$$\text{Example. } \frac{6}{\frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4}} = \frac{6}{24}$$

III. *To reduce improper Fractions into whole Numbers.*

Divide the Numerator by the Denominator.

$$\text{Example. } 2\frac{3}{4} = \frac{23}{4} = 5\frac{3}{4}$$

IV. *To reduce a whole Number into an Improper Fraction.*

Let the Number given be the Numerator, and 1 the Denominator.

Example. Reduce 13 Integers into an improper Fraction: *facit* $13\frac{1}{1}$

V. To

V. *To reduce a whole Number join'd with a Fraction into one Denomination.*

Multiply the whole Number into the Denominator of the Fraction, adding thereto the Numerator.

Example. 5 Yards and $\frac{3}{4}$ facit $5\frac{3}{4}$.

VI. *To reduce a greater Fraction into a lesser Term, equivaluable to it self.*

Take the half of the Numerator, and half of the Denominator as oft as you can, and when you can take the half no further, take the one third, or the one fourth, or the one fifth, &c. both of the Numerator and Denominator.

Example.

I would abbreviate $\frac{24}{120} \frac{12}{60} \frac{6}{30} \frac{3}{15} \frac{1}{5}$

Take the half of 24, which is 12, then the half of 120, which is 60; again the half of 12, which is 6, and the half of 60 is 30, then the half of 6 is 3, and the half of 30 is 15: Here you see that the half cannot be taken both of the Numerator and Denominator, therefore try whether it will be abbreviated by 3, as thus: How

E

many

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many times 3 in 3, once ; then how many times 3 in 15, 5 times. So that $\frac{1}{3}$ is in the lowest Denomination, yet it retains the same Value ; for $\frac{1}{3}$ is equal to $\frac{2}{6}$.

A second kind of Abbreviation.

Though by the former Rule all Fractions might be abbreviated, yet when you cannot take $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8},$ or $\frac{1}{9},$ &c. they seem more tedious by this second way, as may appear.

I would have this Sum abbreviated, $\frac{3077}{4183}$ into a lesser Fraction.

For the reducing whereof, divide the Denominator by the Numerator, and the Remainder of the Division will be 1086, by which divide the former Divisor 3077 ; and there will remain 905, by which divide your last Divisor 1086, and there will remain 181, by which Remains likewise divide the Divisor 905, and there will remain 0.

Where note, that having divided your Denominator by the Numerator, and the Divisor of every Division so often by the Remains, that nothing will remain ; then that last Divisor will divide both the Numerator and Denominator of your Fraction :

As

Chap. VIII. Reduction of Fractions. 75

As in the Example.

$\frac{3077}{4163}$ facit $\frac{17}{23}$, equal to the former.

How to reduce or alter any Fraction to another Denomination, as Money, Weight, or Measure, &c.

Multiply the Numerator by such a new Denominator or Number which you intend, dividing the Product by the former Fractions Denominator, whose Quotient shall be Numerator to the Denominator last chosen.

Example.

What is $\frac{2}{3}$ of 12 d?

$\frac{2}{3}$ 24 (8 d.)

What is $\frac{1}{2}$ of 20 Shillings?

What is $\frac{7}{8}$ of a Flemish Ell?

What is $\frac{3}{4}$ of a Yard?

What is $\frac{2}{3}$ of a Tun of Wine?

What is $\frac{4}{5}$ of a Tun of Iron?

What is $\frac{2}{10}$ of a Hoghead of Sack?

What is $\frac{4}{5}$ of a Dollar at 4 s. 8 d?

Facit 44 d. $\frac{4}{5}$.

6

What is $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of 5 Shillings?

24

E 2

Re-

As

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Reduce Fractions of Fractions to one single Fraction, and work as before.

$$\frac{6}{24} \div \frac{1}{12} \div \frac{1}{4} \text{ of } 8 \text{ (1 s. and } \frac{1}{4}.$$

What is $\frac{4}{5}$ of a Dollar at 4 s. 8 d.

Facit 44 d. $\frac{2}{3}$.

C H A P. IX.

Addition of Fractions.

ADdition of Fractions is the putting of two or more broken Numbers into one Sum, or principal Fraction.

In this Rule and the next, observe, that all Fractions whatever, proper, or improper, must be of one Denomination, or reduced thereto by the former Rules.

2. Being of one Denomination only, add all the Numerators together, which Total subscribe for a new Numerator over the common Denominator.

Example.

Add $\frac{2}{3}$ and $\frac{3}{3}$ of any thing together.

$\frac{2}{3}$ and $\frac{3}{3}$ *facit* $\frac{5}{3}$, or one whole one.

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326

60|80|90|96

Add $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ & $\frac{4}{5}$ together, *facit* $\frac{316}{120}$.

120

Reduce them into one Denomination by the first Rule of Reduction ; then add the Numerators, as in the last Example.

A more speedy Way.

Multiply all the Denominators that differ in Quantity each from other, and the Total thereof shall be the common Denominator and Dividend to each particular Denominator, whose Quotient multiply into its Numerator, and set it directly against its own Fraction, and in fine, add them all up, which Total shall be a new Numerator unto the common Denominator ; and add as many Integers as they make to the whole Numbers.

Example. lb.

(24 or 12

620	$\frac{1}{4}$	3
271	$\frac{1}{3}$	4
103	$\frac{1}{2}$	6
017	$\frac{3}{4}$	9
710	$\frac{1}{2}$	6
<hr/>		<hr/>
1723	$\frac{3}{3}$	$\frac{38}{12}$

4
28 (2
12

E 3

III. Ret

78 *Addition of Fractions.* Chap. IX.

III. *Yet a more short Way.*

Cast your Eye upon the Denominators; and imagine what Number will be divided by them all, and that shall be your common Denominator, and Dividend unto each particular Denominator; then work as before in the last Examples. (12)

Number 12 will be divided by all the Denominators.

$$\begin{array}{r}
 472 - \frac{3}{8} 6 \\
 315 - \frac{3}{4} 9 \\
 917 - \frac{1}{2} 6 \\
 106 - \frac{3}{8} 8 \\
 371 - \frac{1}{6} 2 \\
 129 - \frac{1}{4} 3 \\
 \hline
 2308 - \frac{5}{6} \frac{34}{12}
 \end{array}$$

10
34 (2
12

IV. *Addition of Fractions of Fractions.*

Reduce your Fractions into a single Fraction, according to the second Rule in Reduction; then work as before.

Example. Add $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{1}{4}$ unto $\frac{4}{5}$ of $\frac{6}{7}$

$$\begin{array}{r}
 6 \quad | \quad 24 \quad | \quad 210 \quad | \quad 576 \\
 \hline
 \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{1}{4} \text{ unto } \frac{4}{5} \text{ of } \frac{6}{7} : \quad \frac{6}{24} \frac{24}{35} : \quad \frac{210}{37} \\
 \hline
 24 \quad | \quad 35 \quad | \quad 840 \text{ facit } \frac{186}{840}
 \end{array}$$

V. *Ad-*

Chap. X. Subtraction of Fractions. 79

V. Addition of Improper Fractions.

Reduce your Fractions into one Denomination, and Work *ut supra*.

Example. Add $\frac{1}{4}$ and $\frac{7}{8}$

$$\begin{array}{r} 58 \\ \hline 30 28 \\ \frac{1}{4} \frac{7}{8} \text{ facit } \frac{18}{8} \\ \hline 24 \end{array}$$

VI. To add a single Fraction unto a Fraction of Fractions.

Example. Add $\frac{3}{4}$ and $\frac{1}{3}$ of $\frac{4}{5}$ together, $\frac{1}{3}$ of $\frac{4}{5}$ reduce into a single Fraction, according to the second Section in pag. 72. and work as before.

$$\begin{array}{r} 61 \\ \hline 4 16 45 \\ \frac{1}{3} \text{ of } \frac{4}{5} \frac{4}{15} \text{ and } \frac{3}{4} \text{ facit } \frac{61}{60} \\ \hline 15 60 \end{array}$$

CHAP. X.

Subtraction of Fractions.

SUBTRACTION is the taking of one Fraction from one another, a less from a greater, or an equal from an equal.

80 *Subtraction of Fractions.* Chap. X.

1. Because Subtraction teacheth to take a lesser Fraction from a greater, it will not be amiss to shew you how to know the one from the other.

2. Those Fractions are accounted the greatest, whose Numerator, multiplied by the Denominator of the other Fraction, maketh the greatest Number.

And as in *Addition*, so here, all Fractions to be subtracted must be of one Denomination, or reduced thereunto.

II. *To subtract Fractions of one Denomination.*

Subtract one Numerator from the other, and set the Remain over the common Denominator.

Example.

Subtract $\frac{2}{7}$ from $\frac{3}{7}$ there remains $\frac{1}{7}$.

III. *To subtract a whole Number and a Fraction from a whole Number and a Fraction.*

First, reduce your Fractions into one Denomination, then subtract the one Numerator from the other; and for the Integer, subtract as you were taught in whole Numbers.

Example.

Received 30 l. $\frac{3}{4}$ Laid out 10 l.

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$$\begin{array}{r} 6 \qquad 4 \\ \frac{3}{4} \qquad \frac{1}{2} \text{ Remains } \frac{2}{8} \text{ or } \frac{1}{4}. \\ \hline 8 \end{array}$$

IV. *Another Way.*

Multiply the Denominators together, and let the Product be the common Denominator, which common Denominator divide by each particular Denominator, and multiply the Quotients by their Numerators, and set down their Products directly against its Fraction, and then subtract as if it were in whole Numbers.

As for Example.

$$\begin{array}{r} \text{Received—} 100 \text{ l. } \frac{2}{6} \text{ 25} \\ \text{Spent—} \quad 93 \text{ l. } \frac{3}{4} \text{ 18} \\ \hline \end{array}$$

$$\text{Remains—} 7 : \frac{7}{16}$$

V. *When the Fraction to be subtracted, is greater than the Fraction you are to subtract from,*
Reduce them into one common Denominator (as you did in the last Example) and subtract the greatest Numerator from the common Denominator, and add the Remains to the Numerator of the less, which subscribe for a new Numerator unto the common Denominator; then carry one

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to the next Integer, and subtract as in whole Numbers.

	<i>l.</i>	<i>s.</i>		<i>C.</i>
Received	5	0	Bought	16 $\frac{1}{2}$ 7
Païd	3	$\frac{2}{3}$	Sold	14 $\frac{3}{4}$ 12
Remains	1	$\frac{1}{3}$	Remains	1 $\frac{2}{3}$ 8

VI. When Fractions of Fractions are to be subtracted, they must be reduced into single Fractions, then subtracted as before.

Example. $\frac{1}{2}$ of $\frac{2}{3}$ to be subtracted from $\frac{3}{4}$ of $\frac{4}{5}$; being reduced into single Fractions, they are $\frac{1}{5}$ and $\frac{3}{5}$.

$$\begin{array}{r}
 \frac{3}{5} \\
 \underline{\frac{1}{5}} \\
 15
 \end{array}
 \qquad
 \begin{array}{r}
 4 \\
 \frac{9}{5} \\
 \text{Remain } \frac{4}{5}
 \end{array}$$

CHAP. XI.

Multiplication of Fractions.

IN Multiplication of Fractions, whether they be proper, improper, mixt, or compound, they must likewise be reduced to single Fractions: Multiply the Numerators therefore together, and the Product shall be a new Numerator; then multiply all the Denominators, and the Product thereof shall be the Denominator.

Ex-

Chap. XI. *Multiplication of Fractions.* 82

Example
 Multiply $\frac{2}{3}$ by $\frac{3}{4}$ $\left| \begin{array}{l} 6 \\ \frac{2}{3} \times \frac{3}{4} \text{ facit } \frac{6}{12} \text{ or } \frac{1}{2} \end{array} \right.$

It might seem somewhat strange to young Learners, that $\frac{2}{3}$ of a Pound being multiplied by $\frac{3}{4}$ of a Pound, should make but $\frac{1}{2}$: Therefore to inform them, I think meet to acquaint them, that as whole Numbers multiplied by whole Numbers, do increase the Product; so Proper Fractions multiplied by Proper Fractions do diminish the Product: For as 1 multiplied by 1 makes but 1, so that which is less than 1 being multiplied by that which is less than 1, must needs make less than either of them: Or thus,

$$\begin{array}{r} 2 \\ \frac{2}{3} \\ \frac{3}{4} \\ \hline 6 \\ 12 \end{array}$$

To Multiply Fractions of Fractions.

II. Reduce them into single Fractions, then work as before.

Example. $\frac{3}{5}$ of $\frac{1}{6}$ by $\frac{1}{2}$ of $\frac{2}{3}$ being reduced, they are $\frac{1}{2}$ and $\frac{1}{3}$, and being multiplied, facit $\frac{1}{6}$.

To multiply a whole Number and a Fraction together.

III. Multiply the Numerator by the whole Num-

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Number, and divide the Product by the Denominator.

Example. Multiply 4 by $\frac{3}{4}$ *12 (3 facit.*

4

*To multiply a whole Number and a Fraction.
by a whole Number.*

IV. Reduce the whole Number and Fraction into an Improper Fraction, then work as before.

Example. 2 and $\frac{2}{3}$ by 4 *facit* $3\frac{2}{3}$, or $10\frac{2}{3}$.

*To multiply a whole Number and a Fraction.
by a whole Number and a Fraction.*

Reduce each of them into an Improper Fraction, and work as before in *Sett. I.*

Example. Multiply 3 and $\frac{1}{4}$ by 2 and $\frac{1}{3}$
 $3\frac{1}{4}$ by $2\frac{1}{3}$ *facit* $7\frac{1}{12}$ or $7\frac{1}{12}$.

CHAP. XII.

Division of FRACTIONS.

AS in Multiplication, so in this, all Fractions, that are to be divided, must be reduced to single Fractions both for the Dividend or Divisor: Then set that Fraction, which is the Dividend, on the left

Chap. XII. Division of Fractions. 85

left hand, and that for Divisor on the right hand; then multiply cross-wise the Numerator of the Dividend by the Denominator of the Divisor, and subscribe the Product for a new Numerator: Likewise multiply the Denominator of the Dividend by the Divisor's Numerator, and the Product shall be a new Denominator.

Example.

What is the Quotient of $\frac{4}{5}$ divided by $\frac{3}{4}$.

Place your Fractions thus, with this \times Character between them, and work according to the Directions before given, $\frac{4}{5} \times \frac{3}{4}$

$\frac{12}{20}$

Facit $\frac{12}{20}$, or one whole one, and $\frac{1}{5}$.

I demand the Quotient of $\frac{2}{3}$ divided by $\frac{3}{4}$?

$\frac{2}{3} \times \frac{4}{3}$

Facit $\frac{8}{9}$

In the Division of whole Numbers, the Dividend must be always greater than the Divisor, otherwise you can make no Quotient. But in Division of Fractions it is otherwise, as in the second Question propounded, $\frac{2}{3}$ to be divided by $\frac{3}{4}$, for $\frac{3}{4}$ is greater or more than $\frac{2}{3}$, yet it may be divided: For as the Multiplication of Proper Fractions (as we said before) doth diminish the Product; so Division of Proper Fractions doth increase the Quotient.

II. To

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II. To divide a whole Number by a Fraction.

I demand the Quotient of 20 divided by $\frac{1}{2}$?

20. Being the whole Number, convert it into an Improper Fraction, by placing an Unit for a Denominator, and it standeth thus :

$$\begin{array}{r} \frac{1}{2} \times \frac{20}{1} \\ \hline \text{facit } 40 \end{array}$$

III. To divide a whole Number and a Fraction by a whole Number and a Fraction.

I demand the Quotient of 5 and $\frac{1}{2}$ divided by 3 $\frac{1}{4}$?

$$\begin{array}{r} \frac{5\frac{1}{2}}{1} \times \frac{4}{3\frac{1}{4}} \\ \hline \text{facit } \frac{44}{28} \end{array}$$

IV. To divide Fractions of Fractions.

I demand the Quotient of $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ divided by $\frac{2}{3}$ of $\frac{1}{2}$?

Reduce the Dividend into one single Fraction, and likewise the Divisor ; then work as before.

$$\begin{array}{r} \frac{2}{3} \times \frac{6}{24} \\ \hline \text{facit } \frac{36}{48} \end{array}$$

CHAP.

C H A P. XIII.

The Rule of Three.

I. **T**HE *Rule of Three* is commonly called *The Golden Rule*; and indeed it may rightly be so termed; for as Gold transcends all other Metals; so doth this Rule all others in Arithmetick.

II. Now for your better Information concerning it, you must observe, that there are three Numbers known, by which a fourth that is unknown may be found out, which bears like Proportion to the third, as the second doth to the first.

III. Here also is to be noted, that if your Sums consist of sundry Denominations, then the first and third Numbers must be of the same Denomination, as also the fourth and the second: As thus, If the first Number be Yards, the third likewise must be Yards; if the second be Pence, then the fourth must be Pence.

IV. But the greatest Difficulty lieth in stating the Question.

There-

Therefore observe first, That what you desire to know or to be resolv'd in the Question, must be your third Number: And you have commonly these Words before it, as, *What cost? How long? How broad? how much? How deep? &c.*

2. Your Question being stated, bring your first and third Numbers into one Denomination.

3. Bring your second into the least Name mentioned, or as low as you desire the Question to be answer'd in.

4. Observe whether your third Number requires *more or less*; if *more*, then multiply the middle Number by the greater of the two Extremes, and divide by the lesser, and the Quotient answereth the Question.

But if it require a *less*, then multiply the middle Number by the lesser of the two Extremes, and divide by the greater.

These two Words, *more or less*, being well observ'd, the Scholar will understand what he doth, and need not to make two distinct *Rules of Three*, as most do.

The four first Questions are stated four several ways, by which the one is a Proof of the other.

And

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And as you may easily work all the rest, which will be advantageous to the Scholar, and likewise an Ease to the Master; I shall therefore only give you the *Facits* of the following Questions.

If 6 Yards cost 10 s. what 12 Yards?

$$\begin{array}{r} 10 \\ \hline \end{array}$$

$$\begin{array}{r} 120 \\ 120 \text{ (20 Shillings.)} \\ 88 \end{array}$$

If 12 Yards ——— 20 s. ——— 6 Yards?

$$\begin{array}{r} 20 \\ \hline \end{array}$$

$$\begin{array}{r} 120 \text{ (10 s.)} \\ 122 \\ 8 \end{array}$$

If 20 s. buy 12 Yards, what will 10 s.

$$\begin{array}{r} 12 \\ \hline \end{array}$$

$$\begin{array}{r} 120 \\ 120 \text{ (6 Yards.)} \\ 20 \end{array}$$

If 10 s. ——— 6 Yards ——— 20 s.

$$\begin{array}{r} 6 \\ \hline \end{array}$$

$$\begin{array}{r} 120 \\ 120 \text{ (12 Yards.)} \\ 100 \\ 20 \end{array}$$

If

If 6 Men will be finishing a Piece of Work
10 Days, how long will 12 Men be doing
the same?

<i>Men.</i>	<i>Days.</i>	<i>Men.</i>
6	10	12
10		

60

60 (5 Days.
x2

If 12 Men — 5 Days — 6 Men?

60

60 (10 Days.
60

If 5 Days — 12 Men — 10 Days?

12

60

60 (6 Men.
x0

If 10 Days — 6 Men — 5 Days?

6

60

x
60 (12 Men;
88

If

XII.
Work
doing

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If 2 lb cost 9 d. $\frac{3}{4}$, what cost 2 C. $\frac{1}{2}$?

$\begin{array}{r} 4 \\ \hline 39 \text{ qrs.} \end{array}$	$\begin{array}{r} 4 \\ \hline 10 \\ 28 \\ \hline 80 \\ 20 \end{array}$
--	--

x

$$\begin{array}{r} 10920 \text{ (5460 qrs.} \\ 2222 \end{array}$$

$$\begin{array}{r} 280 \text{ lb.} \\ 39 \\ \hline \end{array}$$

$$\begin{array}{r} 2520 \\ 840 \\ \hline \end{array}$$

10920

If 280 lb ————— 5460 qrs. ————— 2 lb ?

$$\begin{array}{r} 2 \\ \hline 10920 \end{array}$$

$$\begin{array}{r} 280 \\ 10920 \text{ (39 qrs. facit.} \\ 2880 \\ 2 \end{array}$$

If 5460 qrs. ————— 280 lb. ————— 39 qrs ?

$$\begin{array}{r} 280 \\ 10920 \text{ (2 lb. facit} \\ 8400 \end{array}$$

$$\begin{array}{r} 280 \\ \hline 3120 \\ 78 \\ \hline \end{array}$$

10920 If

Days.

Days.

Men.

Men;

If

If 39 Qrs. — 2 lb. — 5460 Qrs.?

2

3x 10920
x0920 (280 lb facit.

3999

33

If I spend 476 l. 11 s. 10 d. a Year, I demand how much that is one Day with another?

Days. l. s. d. Day.
If 365 — 476 — 11 — 10 — 1

29

9531

12

19062

9532

114382 d.

(1

x2 (3

483 (7

xx4382 (313 d.

36888

366

3

If

XIII

If 1 Day — 313 d. — 365 Days.

313

1095

3657

10953

1

114382 d.

I de.
ano.

If 313 d. — 1 d. — 114382 d.

(1

27

(3

2040

(7

114382 (365 Days.

32333

322

3

Days.

If 114382 d. — 365 — 313 d.

365

1565

18787

9393

1

114382 (1 d.

114382

114382

At

If

At 15 *d.* $\frac{1}{4}$ per lb. how many C. weight for
11 l. 11 s. 11 *d.*

Facit 1 C. $\frac{1}{2}$ 14 lb. $\frac{30}{81}$.

If 9 Ells $\frac{1}{2}$ cost 27 s. 5 *d.* what cost 80
Pieces, each 25 Yards $\frac{1}{4}$, and 12 Pieces, each
19 Ells $\frac{3}{4}$?

Facit 275 l. 16 s. 8 *d.* $\frac{12}{23}$.

If 100 lb of Cloves cost 88 l. 11 s. 10 *d.*
and 1 C. weight of Mace 99 l. 10 s. 3 *d.*
what cost 3 $\frac{1}{3}$ one with another?

Facit 3 s. 3 *d.* $\frac{3147}{3392}$.

If 1 Pair of Stockings cost 10 Groats, how
many dozen Pair shall I have for 100 Marks?

Facit 33 dozen Pair $\frac{1}{3}$.

If 7 lb $\frac{1}{2}$ of Currants cost 2 s. 7 *d.* what
cost 3 Butts, each 15 C. $\frac{1}{2}$ 14 lb gross, Tare
139 lb per Butt?

Facit 88 l. 8 s. 0 *d.* $\frac{2}{5}$.

If 5 Ells $\frac{3}{4}$ of Cambrick cost 21 s. 8 *d.*
what cost 120 Pieces, viz.

			Ells.	qrs.	na.
Number	A	30	qt.	272	—2—1
	B	50	qt.	401	—3—1
	C	40	qt.	341	—1—3
				<hr/>	
				1015—2—1	

Facit 196 l. 8 s. 9 *d.* 3 q. $\frac{4}{5}$.

Sold

Sold 5 Bags of Pepper, each, viz. Tare 43 lb per Bag, and Tret 4 lb per 104 lb at 15d. $\frac{1}{4}$ per Pound neat; what comes it to neat?

Also I demand how many Dollars of 4s. 8d. a-piece will pay for the neat weight?

		C.	qrs.
Number	G	qt.	3 — 2
	H	qt.	4 — 1
	L	qt.	5 — 3
	M	qt.	2 — 1
	O	qt.	3 — 3
<hr/>			
Facit 515 Doll. $\frac{174}{323}$ or $\frac{87}{112}$			
<hr/>			
19 — 2			

Sold 10 Packs of Cloth, each Pack qt. 10 Clothes, and each Cloth 39 Yards, at 11s. 11d. per Yard; I demand how much it comes to in all?

Facit 2323 l. 15s. 0d.
C. qrs. lb.

Bought of several Persons 433 — 3 — 17 of Currants, at 4d. per lb to whom I have sold 519 C. 3 qrs. 7 lb of Sugar at 2d. $\frac{3}{4}$ per lb. Now I would know what remains for me to pay, they having taken the Sugar in part of Payment.

l.	s.	d.
809	19	00
667	01	10 $\frac{1}{4}$
<hr/>		

Facit Rem. to pay — 142 — 17 — 01 $\frac{3}{4}$
A

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A Merchant died, being indebted to several Creditors, (*viz.*) to A. 40 *l.* to B. 56 *l.* to C. 80 *l.* Now he being dead, his Estate was worth but 30 *l.* I demand what each Man must have ?

$$\begin{array}{r} A - 6 \frac{1}{7} \frac{4}{6} \\ B - 9 \frac{1}{7} \frac{2}{6} \\ C - 13 \frac{1}{7} \frac{1}{6} \\ \hline \end{array}$$

Facit 30 *l.*

Bought 100 Pieces of Cloth for 411 *l.* 11 *s.* 11 *d.* What containeth the Cloth, the Yard being valued at 7 *s.* 8 *d.*

Facit 1073 Yards $\frac{67}{8}$.

If 1 Pound of Virginia Tobacco cost 10. $\frac{1}{2}$, what cost 3 Hogsheads, weight 17 C. $\frac{1}{2}$ 12 lb. gross, Tare 37 lb. per Hogshead, and 4 lb. per 104 lb. Tret ?

Facit 78 *l.* 6 *s.* 3 *d.*

Also I demand how many Duckets of 3 *s.* 9 *d.* $\frac{1}{4}$ will pay for the Neat Weight ?

Facit 413 Duckets $\frac{65}{81}$.

A

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A Merchant hath owing 357*l.* 9*s.* and his Debtor doth agree with him to pay him for every Pound 13*s.* 5*d.* I demand what must he pay?

facit 239*l.* 15*s.* 9*d.* $\frac{2}{16}$.

A Man died, having three Sons and two Daughters, he gave to the eldest Son 2000*l.* to the second 1900*l.* to the third 1000*l.* to the Eldest Daughter 700*l.* to the second 500*l.* Now, he being dead, his Estate was worth but 2020*l.* I demand what each Child must have?

	<i>l.</i>	
Eldest Son	662	$\frac{18}{64}$
Second Son	629	$\frac{14}{64}$
Third Son	331	$\frac{2}{64}$
Eldest Daughter	231	$\frac{49}{64}$
Second Daughter	165	$\frac{35}{64}$

facit 2020

If I buy a Piece of Cloath for 84*l.* 11*s.* and I sell the Ell *Eng.* for 7*s.* 8*d.* I demand how many Yards were contained in the said Piece?

facit 275 Yards $\frac{1}{2}$ and $\frac{19}{32}$ of a qr.

F

Sold

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Sold 4 parcels of Sugar, containing as followeth:

	C.	qrs.	lb.	
The first containing	86	—2—	21	tare 84
The second containing	76	—1—	12	tare 56
The third containing	98	—3—	11	tare 92
The fourth containing	75	—1—	17	tare 85

At 35 s. per C. neat, facit 585 l. 6 s. $\frac{28}{11\frac{1}{2}}$ or 3 d.

If 50 C. 3 qrs. 15 lb. of Sugar cost 21 l. 19 s. 11 d. how many Chests of 86 C. $\frac{1}{2}$ shall I have for 1000 Marks and 486 l.

facit 30 Chests and $\frac{2000}{3288}$ of a Chest.

If 5 penny-weight of Silver cost 7 d. $\frac{1}{4}$, what cost 3 Ingots, each 11 lb. $\frac{1}{2}$?

facit 50 l. 0 s 6 d.

If a Gent. hath 960 l. 12 s. per annum, how much may he spend one day with another, to lay up 100 Marks at the years end to purchase withall?

facit 136 greats $\frac{346}{385}$ per diem.

A Merchant bought 376 Cloths, at 11 l. 11 s. 1 d. per Cloth, which he ship'd for Spain, to have returns from thence, the one half in Wine, at 28 l. per Tun, and the other half in Sugar, at 27 s. per

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per C. weight, I demand how much of each must be returned for the said Cloths ?

77 Tuns $\frac{971}{1280}$ of Wine.
1609 C. 2 lb $\frac{61}{87}$ of Sugar.

There are 101 Pipes of Oyl, that contain 12307 Gallons, I would know how much 59 Pipes and $\frac{1}{2}$ will contain, and what it will amount to at 36 l. per Tun, the Tun being 236 Gallons.

facit 1105 l. 18 s. 7 d. $\frac{172}{136}$.

A Merchant bought 9870 C. $\frac{1}{2}$ of Lead, which cost 7 l. 8 s. 5 d. per Fother, (or 19 C. $\frac{1}{2}$) the charges upon the same amount to 125 l. 12 s. which he ventures for *France*, to receive from thence *French Wine* at 13 l. 10 s. per Hogshead : I demand how many Hogsheads he must receive for content ?

facit 287 Hogsheads $\frac{1769}{3240}$

A Grocer delivered 7657 lb. of Tobacco in the Roll to be cut and dried, and when it came home, it held out but 5839 lb. I demand what is lost in the pound, and also supposing it cost in the Roll 8 d. $\frac{1}{2}$ per lb. and the cutting

F 2

1 d.

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1 d. $\frac{1}{4}$ per Pound, I demand what it now stands him in?

1 l. ——— 9 d. $\frac{3}{4}$. ——— 7657 l.

It stands him in 311 l. 1 s. 3 d. $\frac{3}{4}$.

7657 l. ——— 1818 l. ——— 1 l.

facit 3 $\frac{3}{78\frac{1}{2}}$ lost per Pound.

CHAP. XIV.

The Rule of Three in Fractions.

AS in the Rule of Three in whole Numbers, I laid down certain Principles both for the better discovering, and more easie working thereof: So in this of Fractions, I shall endeavour to make all things as plain and familiar as may be.

And first, because many Questions seem very ambiguous, whether they belong to the *Rule of Three direct*, or *indirect*.

That you may be rightly informed concerning them, cast your Eye upon the third Number in the Question, and see whether it be greater or lesser than the first Number.

But if you cannot easily apprehend which is the greater or lesser, then work according to the second Section in pag. 80.

What

What questions belong to the Rule of Three direct.

If the third Number be greater than the first, and the Answer required be greater than the second, it is upon the Rule of Three direct.

And likewise if the third Number be less than the first, and the Answer required be less than the second, it belongs to the same Rule.

What questions belong to the Rule of Three indirect.

But if the third Number be less than the first, and the Answer required be greater than the second, it is pertaining to the indirect Rule.

And if the third Number be greater than the first, and the Answer required less than the second, it is according to the same Rule.

Having thus found out to what Rule it belongs, first consider diligently, *viz.* whether the first and third Numbers be both of one Denomination, if not, they must be reduced into the least of these Denominations.

2. That your second being a compound Fraction, must be reduced into the lowest or least Name mentioned.

The Operation of the Rule of Three direct.

Multiply the Denominator of the first Fraction into the Numerator of the second, and third, and the Total thereof shall be the Dividend.

Multiply also the Numerator of the first Number by the Denominator of the second, and that Product by the Denominator of the third, and the Total shall be the Divisor.

The Operation of the Rule of Three indirect.

But when the Questions belong to the indirect Rule, multiply the Numerator of the first and second together, and the whole thereof by the Denominator of the third, and the Product shall be the Dividend.

Multiply also the Denominators of the first and second together, and the Total thereof by the Numerator of the third, and the Product that ariseth therefrom shall be the Divisor.

Example.

Example.

If $\frac{2}{3}$ of an Ell cost $\frac{1}{3}$ of a l. what cost $\frac{4}{3}$?

$\frac{4}{3}$
 $\frac{2}{3}$
 $\frac{4}{3}$ Dividend

$\frac{1}{3}$
 $\frac{1}{3}$
 $\frac{1}{3}$ Divisor.

(1 l.
4 (0 1 $\frac{1}{3}$ facit.
30

$\frac{4}{3}$ Ell ————— 1 l. $\frac{1}{3}$ ————— $\frac{2}{3}$ Ell?

$\frac{4}{3}$
 $\frac{2}{3}$
 $\frac{4}{3}$ Dividend.

$\frac{1}{3}$
 $\frac{1}{3}$
 $\frac{1}{3}$ Divisor.

$\frac{40}{30} | \frac{2}{3}$ l. facit.

$\frac{2}{3}$ l. ————— $\frac{2}{3}$ Ell ————— 1 l. $\frac{1}{3}$?

$\frac{24}{30} | \frac{12}{30} | \frac{4}{3}$ Ell facit.

1 l. $\frac{1}{3}$ ————— $\frac{4}{3}$ Ell ————— $\frac{2}{3}$ l?

$\frac{1}{3}$
 $\frac{4}{3}$
 $\frac{12}{30}$
 $\frac{2}{3}$
 $\frac{24}{30}$

$\frac{1}{3}$
 $\frac{4}{3}$
 $\frac{12}{30}$
 $\frac{2}{3}$
 $\frac{24}{30}$

$\frac{24}{30} | \frac{12}{30} | \frac{6}{15} | \frac{2}{3}$ Ell facit.

For the Proof of these and the following Questions, the same Method is to be ob-

E 4.

served

served as in the Rule of Three in whole Numbers.

$\frac{3}{5}$
 $\frac{3}{5}$
 $\frac{4}{10}$
 (2 s.
 18 (1 $\frac{1}{2}$ facit.
 18

$$\begin{array}{r} 9 \\ 72 \\ \hline -9 \\ 8 \\ 3 \\ 24 \end{array}$$

$$\frac{2}{48} | \frac{36}{48} | \frac{28}{24} | \frac{9}{12} | \frac{3}{4} \text{ of a shilling.}$$

$\frac{36}{48} | \frac{18}{24} | \frac{9}{12} | \frac{3}{4}$ of a lb.

$$\frac{9}{144} \quad \frac{9}{36} \quad \frac{4}{144}$$

$$\frac{72}{144} \mid \frac{16}{72} \mid \frac{18}{36} \mid \frac{1}{2} \text{ of a lb.}$$

To prevent Discouragement to Young Scholars in the Questions of this Rule, which indeed are somewhat intricate, I advise them to turn to the Rule of Three

Three in whole Numbers, and exercise themselves well therein, and especially in such Questions as are most plain and easie, till they thoroughly understand the Nature of the Rule; by means whereof all other Questions will be more easily wrought, be they never so difficult.

If 6 Yards and $\frac{1}{2}$ cost 8 Shillings, what cost 9 Yards and $\frac{1}{3}$?

facit 11 s. $\frac{19}{30}$.

If 1 Dollar be 56 Pence $\frac{1}{3}$, what 500 Dollars?

1 — 56 d. $\frac{1}{3}$ — 500 *facit* 117 l. 18 s. $\frac{1}{3}$

If 2 Ounces and $\frac{1}{2}$ cost 16 s. 5 d. what cost $4\frac{1}{3}$?

facit 59 d. $\frac{1}{10}$.

When the Bushel of Wheat is sold for 6 s. $\frac{2}{3}$, the Half-Penny white Loaf shall weigh 5 $\frac{1}{3}$ $\frac{1}{12}$: I demand how much it ought to weigh when the Bushel is sold for 7 s. $\frac{1}{2}$?

6 s. $\frac{2}{3}$ — 5 $\frac{1}{3}$ $\frac{1}{12}$ — 7 s. $\frac{1}{2}$.
facit 5 $\frac{1}{3}$ $\frac{7}{12}$.

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If 1 Yards cost 9 s. what cost 4 Yards $\frac{1}{2}$?
facit 43 s. $\frac{1}{2}$.

If 3 Ells $\frac{1}{4}$ cost 15 d. $\frac{1}{4}$, what cost 6 Ells $\frac{1}{4}$?
facit 2 s. 7 d. $\frac{31}{2}$.

If $\frac{1}{4}$ of a Yard cost $\frac{4}{5}$ of a l. what cost $\frac{1}{2}$ of a Yard?
facit 10 s. $\frac{10}{3}$.

If 3 Yards and $\frac{1}{2}$ cost 4 l. 14 s. $\frac{14}{17}$, what cost $\frac{6}{7}$ of an Ell *Flemish*?

$\frac{603}{11}$ $\frac{4254}{43}$ $\frac{72}{7}$ *facit* 17 s. $\frac{113318}{191710}$

If 1 lb. cost 6 d. $\frac{1}{3}$, what cost 4 l. $\frac{1}{2}$?
facit 30 d. $\frac{11}{3}$

If 1 Ell $\frac{4}{5}$ cost 9 s. $\frac{7}{8}$, what cost 1 Yard?
facit 4 s. $\frac{7}{8}$.

I lent my Friend $\frac{1}{2}$ of a *French Crown* for three weeks, that he should do as much for me another time: but when I came to borrow of him, he could lend me but $\frac{1}{3}$ of a Crown: I demand how long time I must keep his money to requite my former kindness?

facit 4 weeks $\frac{1}{6}$,

If

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If 1 Pistolet be 5 s. $\frac{9}{10}$, what shall 430 be?
thus,

$$1 \text{ --- } 5 \text{ s. } \frac{9}{10} \text{ --- } 430 \text{ facit } 126 \text{ l. } 17 \text{ s.}$$

If 13 lb. cost me 3 l. how many lb. shall
I have for 97 d.

$$\text{facit } 1 \text{ lb. } \frac{545}{720}$$

If $\frac{1}{4}$ lb. cost 9 d. $\frac{3}{4}$, what cost 6 lb. 9 $\frac{3}{4}$?

$$\text{facit } 342 \frac{1}{10}$$

If 5 Yards of Velvet cost 4 l. 3 d. $\frac{1}{4}$, what
cost 4 Yards $\frac{6}{7}$?

$$\text{facit } 3 \text{ l. } 17 \text{ s. } 11 \text{ d. } 2 \text{ qrs. } \frac{32}{71}$$

If 1 C. $\frac{1}{2}$ cost 4 l. 12 s. what cost $\frac{1}{8}$ C?

$$\frac{12}{7} \text{ --- } 92 \text{ s. --- } \frac{1}{8} \text{ facit } 33 \text{ s. } \frac{13}{4}$$

If 1 C. cost 11 l. $\frac{8}{10}$, what cost 4 $\frac{3}{4}$?

$$\frac{71 \frac{1}{2}}{4} \frac{8}{10} \text{ --- } \frac{12 \frac{1}{2}}{11} \text{ l. --- } 17 \frac{3}{4}$$

If $\frac{1}{2}$ of an Ell cost 1 l. 2 s. what cost $\frac{1}{8}$?

$$\text{facit } 32 \text{ s. } 1 \text{ d.}$$

If 10 Ells cost 3 l. $\frac{1}{2}$, what cost 1 Yard?

$$\frac{50}{3} : \frac{18}{3} : \frac{4}{3} \text{ or } 50 \text{ --- } 18 \text{ --- } 4$$

If $\frac{1}{4}$ C. cost $\frac{6}{11}$ of l. what cost 1 C. $\frac{1}{2}$?

$$\frac{1}{4} \text{ --- } \frac{6}{11} \text{ --- } \frac{1}{2} \text{ facit.}$$

If

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If $\frac{3}{4}$ of C. cost $7\frac{6}{8}$ l. what will 3 s. $7\frac{7}{8}$ buy?
 $11\frac{10}{13}$ s. ——— $\frac{1}{8}$ C. ——— $3\frac{1}{8}$ s. *facit*.

If $\frac{3}{8}$ of a Yard of Cloath in length, and
 1 Yard $\frac{1}{4}$ broad make a Childs Coat, I de-
 mand how much Stuff will make the same
 Child a Coat, when the Stuff is but $\frac{1}{4}$ of a
 Yard broad?

$7\frac{1}{2}$ ——— 3 *facit* 1 Yard $1\frac{7}{8}$.

If 8 lb. $\frac{3}{4}$ cost 2 l. 11 s. $\frac{3}{4}$, how many lb.
 shall I buy for 4 l. $\frac{1}{2}$?
facit

If $\frac{3}{4}$ of 1 C. cost $\frac{1}{16}$ of a l. what cost $\frac{1}{3}$ of
 a Pound?

facit

If $\frac{1}{2}$ of an $\frac{3}{4}$ cost $\frac{1}{12}$ of a Penny, how much
 shall I buy for $\frac{6}{11}$ of 20 s.?

facit

If $\frac{1}{12}$ of a Pound cost $7\frac{1}{2}$ of a l. how many
 Pounds shall I have for 2 l. 7 s. 3 d. $\frac{1}{4}$?

facit

How many Yards are bought for 142 l.
 11 s. 2 d. when the $\frac{1}{2}$ of $\frac{3}{4}$ of a Yard cost
 6 s. $\frac{1}{4}$?
facit

If

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If 1 C. $\frac{1}{4}$ 12 lb. $\frac{1}{2}$ cost 2 l. $\frac{2}{3}$, what cost $\frac{2}{3}$ of an $\frac{1}{3}$?

facit $3\frac{157}{40000}$

If 26 lb. at *Antwerp* be 27 lb. $\frac{2}{3}$ at *London*, how many Pounds at *Antwerp* are 56 lb at *London*?

facit $52\frac{1}{12}$

If 8 Ells at *Antwerp* be 5 Ells $\frac{1}{2}$ at *London*, how many Ells at *Antwerp* are 150 Ells $\frac{1}{2}$?

facit 231 Ells $\frac{1}{4}$

If $3\frac{1}{2}$ times $3\frac{1}{2}$ lb. cost 1 $\frac{1}{2}$ times 1 $\frac{1}{2}$ l. what shall amount unto $\frac{1}{2}$ times $\frac{1}{2}$ of the $\frac{1}{3}$ of 12 l. $\frac{1}{4}$?

$4\frac{2}{4} - \frac{2}{4} - \frac{4}{8}$ facit $\frac{147}{784}$ of a l.

If $\frac{1}{2}$ less $\frac{1}{8}$ lb cost 2 $\frac{1}{4}$ l. and the $\frac{1}{2}$ of $\frac{7}{8}$ lb. what shall 10 lb less $\frac{1}{2}$ and $\frac{1}{4}$ of $3\frac{1}{2}$ lb. amount unto?

$\frac{1}{2} - \frac{17}{24} - \frac{337}{48}$ facit 135—17—0—2

If a *French Crown* be worth 52 d. $5\frac{1}{2}$ Sterl. how many must be received for 100 l. $\frac{2}{9}$ Sterl.

Crown.

$1855\frac{1}{2}$ d. — $\frac{1}{1}$ — 72360 $\frac{2}{3}$

facit 460 Cr. $\frac{44}{3}$.

When

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When $\frac{1}{2}$ of 5 Ells less $\frac{1}{4}$ of an Ell cost $\frac{1}{2}$ of 9 $\frac{1}{2}$ l. less $\frac{1}{8}$ of a l. what then shall $\frac{1}{6}$ of 6 Ells less $\frac{1}{6}$ of an Ell?

$$\frac{4}{2} : \frac{17}{10} : \frac{1}{2} \text{ facit } 1 \frac{41}{148} \text{ l.}$$

If $\frac{2}{3}$ of 20 lb. cost 36 l. less $\frac{1}{4}$ of 30 l. I demand how much $\frac{1}{8}$ of 40 lb. and $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, will amount unto?

$$\frac{40}{3} : \frac{27}{2} : \frac{2538}{72} \text{ facit } 35 \frac{111}{240} \text{ l.}$$

If an Ingot of silver, whose weight is 60 lb, $\frac{1}{2}$ be better 10 $\frac{1}{2}$ $\frac{1}{2}$, I demand the Standard weight of the Ingot, also the Betterness; Note, That the Standard is 11 $\frac{1}{2}$ 2 dwt. First, subtract the Standard-weight from the Betterness, then it follows:

$$\frac{111}{10} : \frac{491}{90} : \frac{5109}{7}$$

3.

358 $\frac{103}{111}$ Betterness.

728 $\frac{1332}{111}$ Weight of the Ingot.

1086 $\frac{11114}{111}$ standard weight in ounces.

lb. 3 dwt.

$$90 : 6 : 13 \frac{377}{111} \text{ facit.}$$

An Ingot of Silver, weight 47 $\frac{1}{2}$ lb, and is worse 14 $\frac{1}{2}$ $\frac{1}{2}$. I demand the Worseness of the Ingot, and also the Standard-weight.

$$\frac{111}{10} : \frac{46}{12} : \frac{573}{11}$$

lb. 13 --- 02 $\frac{1}{2}$ --- 6 dwt. $\frac{14}{111}$ worseness fa.

lb. 34 --- 06 $\frac{1}{2}$ --- 13 dwt. $\frac{127}{111}$ standard fa.

CHAP.

CHAP. XV. RULES of PRACTICE.

Tables of Practice.

	s. d.			d.	
The even	10-0	is	The even	6	parts of a
parts of a	6-8			4	
Pound.	5-0			3	
	4-0			2	
	3-4			1 1/2	
	2-6			1	
	1-0				

BEfore the Learner can well proceed further, he must get these Tables very perfectly by heart; I might puzzle his Head with some others, which, because I conceive would be troublesome and burdensome to his memory, therefore I shall omit

2-12-24
3-12-36
4-12-48
5-12-60
6-12-72
7-12-84
8-12-96
9-12-108
10-12-120
11-12-132
12-12-144
them

them, and observe this plain and easie Method following.

And first I shall begin with the even Parts of a Shilling.

I. When the Price is an even Part of a Shilling, consider what Part of a Shilling it is; which being found, divide the Sum propounded by it, and the Quotient will be Shillings, as in these six Examples following will appear.

<i>Ells.</i>	<i>d.</i>	<i>lb.</i>	<i>d.</i>
8468	at 6 per Ell.	3618	at 2 per lb.
$\frac{1}{2}$ 423 4		$\frac{1}{2}$ 60 3	
211-14-0	facit.	30-3	facit.
867	at 4 d. per Ell.	Yards.	d.
$\frac{1}{3}$ 28 9		2760	at 1 $\frac{1}{2}$ per Y.
14-9-0	facit.	$\frac{1}{8}$ 34 5	
lb.		17-5	facit.
276	at 3 d. per lb.	lb.	d.
$\frac{1}{4}$ 6 9		4896	at 1 per lb.
3-9	facit.	$\frac{1}{12}$ 40 8	
		20-8	facit.

Having

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Having gone thus far upon those even Parts of a Shilling that are most easie. I must intreat the Learner to return back to a farthing, an half penny, three farthings, &c. the other parts of a Shilling.

II. When the price is Farthings, or Half-Pence, bring the given Sum into Pence, and work as before in the last Question; but when they are uneven parts, as penny-farthing, penny-three-farthings, two-pence-farthing, or the like: Begin first with the even parts of a Shilling: As for instance, 6396 Ells at 5 Farthings per Ell; work first for the penny, as before, then consider, if at the price of a penny they come to so many Shillings, then the Farthing must be the fourth part of them, which being taken and added together, your work is done.

Ells.		Ells.	
	420 at $\frac{1}{4}$ d. per Ell.		716 at $\frac{1}{2}$ d. per Ell.
$\frac{1}{4}$	105	$\frac{1}{2}$	358
$\frac{1}{12}$	8- 9 d. facit.	$\frac{1}{12}$	21 9 10 d.
			1-9-10 facit.

Ells

Ells.	d.	Ells.	d.
6396	at $\frac{1}{4}$ per Ell.	7225	at $1\frac{1}{4}$ per Ell.
$\frac{1}{2}$ 3198		$\frac{1}{8}$ 903 — 1 $\frac{2}{3}$	
$\frac{1}{2}$ 266 — 6 d.		$\frac{1}{8}$ 150 — 6 $\frac{1}{4}$	
$\frac{1}{2}$ 133 — 3		105 3 — 7 $\frac{1}{4}$	
39 9 — 9		52-13-7 $\frac{3}{4}$ facit.	
19-19-9 facit.			
5712 at 1 d. $\frac{1}{4}$			
$\frac{1}{4}$ 476			
$\frac{1}{4}$ 119			
59 5			
29 — 15 facit.			

III. When any thing doth remain of any Division, it is of the same Denomination as the Dividend was, as here in the last Example 7225 three half pence being divided by 8, there remains one three-half pence.

En.

864 at 2 d. $\frac{1}{2}$	3716 at 3 d. $\frac{1}{4}$
$\frac{1}{2}$ $\frac{1}{8}$ 144	$\frac{1}{4}$ $\frac{1}{2}$ 929
18	77—5
16 2	100 6—5
8-2-0 <i>facit.</i>	50-6-5 <i>facit.</i>
3714 at 2 d. $\frac{1}{2}$	ff
$\frac{1}{2}$ $\frac{1}{4}$ 619	41712 at 3 d. $\frac{1}{4}$
154-9	$\frac{1}{4}$ $\frac{1}{2}$ 10428
77 3-9	1738
38-13-9 <i>facit.</i>	1216 6
417 at 2 d. $\frac{3}{4}$	608-6-0 <i>facit.</i>
$\frac{1}{2}$ $\frac{1}{4}$ 69—6	817 at 3 d. $\frac{3}{4}$
17—4— $\frac{1}{2}$	$\frac{1}{4}$ $\frac{1}{4}$ 204—3 d.
8—8— $\frac{1}{4}$	51—0 $\frac{3}{4}$
9 5—6— $\frac{3}{4}$	25 5-3 $\frac{3}{4}$
4-15-6 $\frac{3}{4}$ <i>facit.</i>	12-15-3 $\frac{3}{4}$ <i>facit.</i>

7138 at 4 d. $\frac{3}{4}$	712 at 5 d.
$\frac{1}{8}$ 1189—8	$\frac{1}{3}$ 237—4
$\frac{1}{8}$ 1189—8	$\frac{1}{8}$ 59—4
$\frac{1}{8}$ 148—8 $\frac{1}{2}$	29 6—8
252 8—0 $\frac{1}{2}$	14-16-8 <i>facit.</i>
126-8—0 $\frac{1}{2}$ <i>facit.</i>	3716 at 7 d.
5171 at 4 d. $\frac{1}{2}$	$\frac{1}{2}$ 1858
$\frac{1}{3}$ 1723—8	$\frac{1}{8}$ 309—8
$\frac{1}{8}$ 215—5 $\frac{1}{2}$	216 7-8
193 9—1 $\frac{1}{2}$	108-7-8 <i>facit.</i>
96-19—1 $\frac{1}{2}$ <i>facit.</i>	8716 at 8 d.
971 at 4 d. $\frac{1}{4}$	$\frac{1}{3}$ 2905—4
$\frac{1}{3}$ 323—8	2905—4
$\frac{1}{8}$ 40—5— $\frac{1}{2}$	581 0—8
$\frac{1}{8}$ 20—2— $\frac{3}{4}$	290-10-8 <i>facit.</i>
38 4—4— $\frac{3}{4}$	
19-14-4 $\frac{3}{4}$ <i>facit.</i>	

V.

	6371 at 9 d.		2716 at 12 d.
$\frac{1}{2}$	3185—6		271 6
$\frac{1}{2}$	1592—9		135 l. 16 s. facit.
	477 8—3		3762 at 12 d. $\frac{1}{4}$.
	238-18-3 facit.		1881
	346 at 10 d.	$\frac{1}{2}$	940—6
	423	$\frac{1}{2}$	940—6
$\frac{1}{2}$	211—6	$\frac{1}{2}$	78—4 $\frac{1}{2}$
$\frac{1}{3}$	70—6		384 0—4 $\frac{1}{2}$
	70 5—0		192—0—4 $\frac{1}{2}$ facit.
	35-5—0 facit.		
	4687 at 11 d.		
	2343—6		
	1562—4		
$\frac{1}{4}$	390—7		
	429 6—5		
	214-16-5 facit.		

5627 Ells at 13 *d.* per Ell.

IV. As for the 12 *d.* that is done to your hand, there being so many Shillings as there are Ells : then for the Penny, consider that at 12 *d.* per Ell it comes to so much, and for the odd penny take $\frac{1}{12}$ of the given sum, which will make likewise Shillings. And thus you may do touching any of the following Questions, taking the even or uneven parts, as you have learned before.

<div>2684 at 13 <i>d.</i></div> <hr/> <div>2684</div> <div>$\frac{1}{12}$ 223-7</div> <hr/> <div>2907-7</div> <hr/> <div>l. s. d.</div> <div>145-7-7 <i>facit.</i></div>	<div>7684 at 15 <i>d.</i></div> <hr/> <div>7684</div> <div>$\frac{1}{4}$ 1921</div> <hr/> <div>9605</div> <hr/> <div>480-5 <i>facit.</i></div>
<div>8642 at 14 <i>d.</i></div> <hr/> <div>8642</div> <div>$\frac{1}{8}$ 1440-4</div> <hr/> <div>10082-4</div> <hr/> <div>504-2-4 <i>facit.</i></div>	<div>3716 at 16 <i>d.</i></div> <hr/> <div>3716</div> <div>$\frac{1}{3}$ 1238-8 <i>d.</i></div> <hr/> <div>4954-8</div> <hr/> <div>247-14-8 <i>facit.</i></div>

3141 at 17 d.	417 at 21 d.
1236 at 18 d.	1021 at 22 d.
26812 at 19 d.	317 at 23 d.
1213 at 20 d.	1712 at 2 s.

V. Observe that as many yards as there are, so many two shillings; therefore multiply by 2, and the product will be shillings: and this method you may observe in all others.

Or this, if you will.

For those even Parts of a pound that are most familiarly known, as two Shillings, you may take the $\frac{1}{5}$ for 2 Shillings and 6 Pence the $\frac{1}{4}$ for three Shillings and 4 Pence the $\frac{1}{3}$, for 4 Shillings the $\frac{1}{5}$, for 5 Shillings the $\frac{1}{4}$, for 6 Shillings and 8 pence the $\frac{1}{3}$, for 10 Shillings the $\frac{1}{2}$.

$\begin{array}{r} \text{lb.} \\ 1712 \text{ at } 2 \text{ s. per lb.} \\ \hline 2 \end{array}$		$\begin{array}{r} 3672 \text{ at } 2 \text{ s. } 2 \text{ d.} \\ \hline 2 \end{array}$
$\begin{array}{r} 342 4 \end{array}$	$\frac{1}{2}$	$\begin{array}{r} 7344 \\ \hline 612 \end{array}$
$171 \text{ l.} - 4 \text{ s. facit.}$		$795 6$
$\begin{array}{r} \text{Ells.} \\ 7260 \text{ at } 2 \text{ s. } 1 \text{ d.} \\ \hline 2 \end{array}$		$397 \text{ l. } 16 \text{ s. facit.}$
$\begin{array}{r} 14520 \\ \hline 605 \end{array}$	$\frac{1}{2}$	<p>If Pence be required in the <i>Question</i>, the Parts for Pence take out of the given Sum, as in these three last Examples do appear.</p>
$1512 5$		
$756 - 5 \text{ s. facit.}$	$\frac{1}{2}$	
$412 \text{ at } 2 \text{ s. } 3 \text{ d.}$		
$106 \text{ at } 2 \text{ s. } 4 \text{ d.}$		
$171 \text{ at } 2 \text{ s. } 5 \text{ d.}$		$1410 \text{ at } 2 \text{ s. } 6 \text{ d.}$
		$712 \text{ at } 2 \text{ s. } 7 \text{ d.}$
		$100 \text{ at } 2 \text{ s. } 8 \text{ d.}$

6101 at 2 s. 9 d.	6109 at 2 s. 11 d.
1006 at 2 s. 10 d.	

4672 Ells and $\frac{1}{2}$ at 4 s. and 4 d. per Ell.

Questions of this nature that do consist of several Denominations, as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c. are wrought as before, only for the half Ell, take half of the given Price of an Ell, &c. for a quarter, take a quarter of the Price, &c. and add it to the former Sum.

Example.

<i>Ells.</i>	<i>C. s. d.</i>
4672 $\frac{1}{2}$ at 4 s. 4 d.	17 $\frac{1}{4}$ at 17-7 per C.
4 2 2	17
18688	119-4-4 $\frac{3}{4}$
$\frac{1}{3}$ 1557-4 d.	17
2-2	8-6
20247-6	1-5
1012-7-6 <i>facit.</i>	4-4 $\frac{3}{4}$
	3012-3 $\frac{3}{4}$
	15-3-3 $\frac{3}{4}$

VII. If the Price required be concerning Pounds neat, you must reduce the Hundreds gross into Pounds gross, and subtract the Pounds tare from them, and the Remains will be Pounds neat.

32 C. gross, tare 172 lb at 7 d. per lb neat.	36 C. gross, tare 94 lb. at 14 d. per lb. neat.
32 112	36 112
64 32 32	72 36 36
3584 lb. gross. 172 lb. tare.	4032 lb. gross. 94 lb. tare.
3412 lb. neat. lb. d.	3938 lb. neat. lb. d.
3412 at 7 per lb.	3938 at 14. per lb.
$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{6}$ 1706 284—4 d.	$\frac{1}{6}$ 3938 656—4 d.
199 0—4 d.	459 4—d.
99-10-4 facit.	229-14-4 facit.

VIII. Again, observe whether the Pounds Tare be absolutely so much as in the last Example, or whether it be so much *per Bag, per C or Barrel, &c.* If it be any of these, multiply the Tare given by the C. Bag, or Barrel, and the Product will be Pounds Tare, which subtract from the Pounds gross, and the Remains are Pounds neat.

Example.

56 C. gross, Tare	
17 lb per C. at 9 d.	
per lb neat.	
56	56
112	17
112	392
56	56
56	952
6272 lb gross.	
952 lb tare.	
5320 lb neat.	
d.	
5320 lb at 9 per lb.	
$\frac{1}{2}$	2660
$\frac{1}{2}$	1330
3990	
199-10 facit.	

12 C. gross, Tare	
13 lb. per C. at 18 d.	
per lb neat.	
12	12
112	13
24	36
12	12
12 lb	tare 156
1344 lb gross	
156 lb tare.	
1188 lb neat.	
d.	
1188 at 18 per lb.	
1188	
594	
17812	
89-2-0 facit.	

G 2

IX. Ob-

IX. Observe whether the given Price required be so much *per C.* if so, then bring your Pounds Tare into *C.* and subtract them from the *C.* gross.

Example.

17 *C.* gross, Tare
11 *lb.* *per C.* at
15 *s.* *per C.* neat.

17

11

17

17

7 (*C.* *qr.* *lb.*)

187 (*1-2-19 ta.*)

xxz

C. *qr.* *lb.*

17-0-0 *gross.*

1-2-19 *tare.*

15-1-9 *neat.*

C. *qr.* *lb.*

15-1-9 at 15*s.* *per C.*

15

75

15

225

3-9

1-2 $\frac{1}{2}$

22|9-11 $\frac{1}{2}$

11 9-11 $\frac{1}{4}$ *facit.*

20 *C.* gross, Tare

13 *lb.* *per C.* at

12 *s.* *per C.* neat.

20

13

60

20

260

(36 *C.* *qr.* *lb.*)

260 (*2-1-8 ta.*)

xxz

C. *qr.* *lb.*

20-0-0 *gross.*

2-1-8 *tare.*

17-2-20 *neat.*

C. *qrs.* *lb.*

17-2-20 at 12 *s.*

12

(*per C.*)

34

17

204

6

2-1 $\frac{1}{2}$

21-2-1 *d.* $\frac{1}{4}$

10-12-1 *d.* $\frac{1}{4}$ *fa.*

X. I

X. I think those former Rules well observed, to be sufficient for your Instruction touching Tare, only if the gross Hundreds have several Species, as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ odd Pounds, or the like, then consider, if one C. give so much Tare, then a quarter of a C. will give a quarter so much; and if one quarter give so much, 14 Pound will give half so much; and if 14 Pound give so much, then 7 Pound will give half as much; &c.

Example.

13 C. $\frac{1}{2}$ gross, Tare	96 C. 14 lb gross,
12 lb. per C. at 2 s.	Tare 13 lb. per C.
3 d. per lb. neat.	at 3 s. 6 d. per lb neat.

What Tret is.

XI. Having thus shew'd you the Way of finding out the Tare, I come in the next place to shew you how to find out the Tret, which is a certain Allowance of 4 lb. per 104 lb. upon many sorts of Commodities.

Example.

39 C. gross, Tare 15 lb. per C. and 4 lb. per 104 lb. Tret, at 4 s. 6 d. per lb. neat.

G 3

1 Bring

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1. Bring the C. gross into Pounds gross.
2. Multiply the lb. tare by the C. gross, and the Product is the Pounds tare.
3. Subtract the lb. tare from the lb. gross, and the remain is subtil Pounds, which Pounds divide by 26, because 26 is contained 4 times in 104, and as often as it is contained; so many Pounds Tret there are, which subtract from the subtil Pounds, and the remain will be neat Pounds.

C.	
39	39
112	15
<hr/>	
78	195
39	39
39	
<hr/>	
4368 lb. gross.	585 lb. tare.
585 lb. tare.	(1
<hr/>	
3783 lb. subtil.	224 lb.
145 lb. tret.	378 (3 (145 tret.
<hr/>	
3638 lb. neat.	2868
	22

At 4 s. 6 d. per lb. fact 821. 4. 13.

Other

Other ways there are to find out the Tare, but I conceive these are the most plain for young Learners: However I shall give them one or two Examples of another manner of working, which is both very commendable and speedy.

1. When the Tare is 14 Pound *per Cent.* take the $\frac{1}{8}$ part of the Pounds gross, and the Quotient will be Pounds Tare.

2. When the allowance is Tare 16 l. *per Cent.* take the $\frac{1}{7}$ part, or divide it by 7, and the Quotient will be Pounds Tare.

3. Suppose it were Tare 24 Pounds *per Cent.* work first for 16 as before, then take the $\frac{1}{2}$ of that which 16 cometh to, for if 16 produce so much, 8 must produce the $\frac{1}{2}$ of that, which being added will make the Pounds Tare for 24 Pounds *per Cent.*

Again, suppose it were at 20 Pound *per Cent.* you may work first for 16, and then 4 will be the $\frac{1}{4}$ of that Quotient, which being added maketh the Total of your Pounds Tare for 20 Pound *per Cent.*

Again, suppose it were for 12 Pound *per Cent.* Tare, work as before for 16, which Quotient is for 4 too much, therefore take the $\frac{1}{4}$ of that, and subtract from that of 16, and the remains will be Pounds Tare, or 12 Pound *per Cent.*

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Again, suppose it were 7 Pounds *per Cent.* Tare, work for 14, and if 14 comes to so much, then 7 will be $\frac{1}{2}$ of that. And you may with Ease work all Questions of this kind, by making 14 or 16 your standing Rule, adding and subtracting the Part or Parts of it more or less, as occasion requires. I might say more as to this, but shall forbear, only I will give you two or three Examples ready cast up, and state a few others to exercise your Ingenuity therewith.

48 C. Gros. Tare 14 lb. *per Cent.* at
10 d. $\frac{1}{2}$ *per lb. neat.*

$$\begin{array}{r}
 \text{C.} \\
 48 \quad 4704 \text{ lb at } 10 \text{ d. } \frac{1}{2} \text{ per lb.} \\
 112 \\
 \hline
 96 \\
 48 \\
 48 \\
 \hline
 5376 \text{ lb. gros.} \\
 \frac{1}{8} 672 \text{ lb. tare.} \\
 \hline
 4704 \text{ lb. neat.}
 \end{array}$$

56 C. $\frac{1}{4}$ gross, Tare	
16 Pound per Cent.	
at 9 d. per Pound	
neat.	
<hr/>	
C.	
56 $\frac{1}{4}$	
4	
<hr/>	
225	
28	
<hr/>	
1800	
450	
<hr/>	
6300 lb. gross.	
$\frac{1}{7}$	900 lb. tare.
<hr/>	
5400 lb neat at 9	
<hr/>	
$\frac{1}{2}$	2700
$\frac{1}{2}$	1350
<hr/>	
4050	
<hr/>	
202-10-0 facit.	

97 C. $\frac{3}{4}$ 11 lb gross.	
Tare 24 lb. per Cent.	
at 5 d. per lb. neat.	
<hr/>	
97 $\frac{3}{4}$ 11	
4	
<hr/>	
391	
28	
<hr/>	
3129	
783	
<hr/>	
10959 lb. gross.	
<hr/>	
1565	
782	
<hr/>	
2347 lb. tare.	
<hr/>	
8612 lb. neat 5 d.	
<hr/>	
2870-8	
717-8	
<hr/>	
35818-4	
<hr/>	
179-8-4 facit.	

19 C. $\frac{1}{2}$ 11 Pound
 gross, Tare 18
 Pound per Cent. at
 7 d. $\frac{1}{2}$ per lb.
 neat.

20 C. $\frac{1}{2}$ 13 Pound
 gross, Tare 12
 Pound per Cent. at
 10 d. per Pound
 neat.

34 C. $\frac{1}{4}$ 19 Pound
 gross, Tare 7
 Pound per Cent. at
 11 d. per lb. neat.

86 C. $\frac{1}{2}$ 13 Pound
 gross, Tare 13
 Pound per Cent. at
 8 d. per lb. neat.

13 C. $\frac{1}{2}$ gross,
 Tare 22 Pound per
 Cent. at 16 d. per
 Pound neat.

19 C. $\frac{1}{4}$ 19 Pound
 gross, Tare 19 lb.
 per Cent. at 18 d.
 per lb. neat.

CHAP. XVI.

The DOUBLE RULE of THREE.

HAVING somewhat at large insisted upon the two last Rules, *viz.* *The Rule of Three* and *Practice*, I come to the second Rule of Proportion, commonly called, *The Double Rule of Three*, which hath its Denomination from its double working: And as I did in the former *Rule of Three* proceed with one plain and easie working of the same either *Direct* or *Indirect*: So I shall here also observe the same Order; but here first a diligent Heed must be had unto the stating of the Question, because under this Rule are comprehended divers Rules of *Plural Proportion*. Therefore observe as as in the former *Rule of Three*, so in this,

1. That first and third Numbers be both of one Species, *viz.* if the first Number be Principal, the third must be Principal; if the first be Interest, the third must be Interest.

If the first be Time, the third must be Time;
if the first be Men, the third must be Men.

2. Ob-

2. Observe that the two first Terms in the Question do consist of a Supposition, and the third Term of Demand.

Example.

If 100 l. in 12 Months gain 6 l. what shall 276 l. gain in 18 Months ?

1. Here you see the Supposition is,
If 100 l. gain 6 l.

2. The Demand is,
What will 276 l. gain ?

$$\begin{array}{r} 100 \text{ l.} \text{-----} 6 \text{ l.} \text{-----} 276 \text{ l.} \\ \quad \quad \quad 20 \quad \quad \quad 1440 \end{array}$$

$$\begin{array}{r} 120 \quad \quad \quad 11040 \end{array}$$

$$\begin{array}{r} 12 \quad \quad \quad 1104 \end{array}$$

$$\begin{array}{r} \text{-----} 276 \end{array}$$

$$\begin{array}{r} 1440 \end{array}$$

Cut off the two first Figures, and the rest are Pence, viz, 3974 d.

Then say,

If 12 Mon. — 3974 d. — what 18 Mon.
facit 5961 d.

If 6 Clerks can write 45 Sheets of Paper in 5 Days, how many Clerks can write 300 Sheets in 13 Days after that Proportion?

Sheets.

Chap. XVI.

Rule of Three.

133

Sheets.

Clerks.

Sheets.

45

6

300

6

Ø

1800

x800 (40 Clerks.

453

4

Days.

Clerks.

Days.

5 ————— 40 ————— 13 *

5

200

* Observe here, and so in others, whether the Demand be more or less, and work as hath been taught.

765 Clerks.

$$200(15 \frac{5}{3}) \text{ facit.}$$

X33

2

If the Carriage of 56 C. weight 100 Miles cost 14 l. what will 13 C. cost being carried 29 Miles, after that rate?

C.

1.

C.

56 ——— 14 ——— 13

-14

-13

I4

(14

x82(3 l. 5 s.

52

86

13

182

If

If 100 Miles — 3 l. 5 s. — 29 Miles ?

$$\begin{array}{r}
 20 \qquad 65 \\
 \hline
 65 \qquad 145 \\
 \qquad 174 \\
 \hline
 18|85
 \end{array}$$

facit 18 s. $\frac{17}{20}$.

If 8 Taylors make four Suits of Gloaths in 10 Days, how many will make 15 Suits in 14 Days ?

If 4 Suits — 8 Taylors — 15 Suits ?

120 (30 *facit*
44

120

If 10 Days — 30 Ta. — 14 Days ?

30
—
300

2 (6
300 (21 $\frac{2}{7}$.

244

x

Of what Principal was 150 l. gained in 19 Months, when 100 l. in 12 Months gained 6 Pound ?

facit 1578 l. $\frac{18}{19}$ Principal.

How

Chap. XVI. Rule of Three. 135

How long time was 900 l. a gaining 420 l. when 6 l. was gained of 100 l. in 12 Months.

facit 93 months $\frac{1}{4}$.

A Scrivener lent 700 l. at Interest the 22 of October 1639, and upon the 9th of Decem. 1645. received for the Interest thereof 330 l. I demand at what Price per Cent. per Annum it was lent?

The Time is 6 Years,

1 Month 17 Days.

facit 7 l. $\frac{10837}{15859}$.

If I sow 20 Bushels of Pease, and they produce in one year 276 Bushels, I demand how many Bushels in 6 years will 90 Bushels produce after that Proportion?

facit 7452 Bushels.

What is the Principal that gained 476 l. in 16 Months, when 100 l. in 12 Months gained 6 l.

5950 l. Principal.

In what time was 850 l. gained of 940 Pounds, when 100 l. in 12 Months gains 6 Pounds?

facit 15 Years, 25 da. $\frac{23}{47}$.

If 100 l. in 12 mon. gained 6 l. what Money was that which gain'd me in 8 Months 10 Pounds?

facit 250 l. Principal.

If

136 *The Double, &c.* Chap. XVI.

If 4 s. 8 d. pay 1 Soldier for 1 Week,
how many Dollars at 4 s. 2 d. will pay 80
Men for one Month ?

facit 358 Dollars $\frac{2}{3}$.

An Usurer lent the 11th of July 1647 a
Sum of Money at Interest for 6 l. per Cent.
and on the 27 of Feb. 1651 received for In-
terest thereof 318 l. 12 s. I demand what
was the Sum lent ?

*The time between
the 11th. of July 47.
to the 27th of Feb. 51.
is four Years, 7 Mon.
16 Days.*

facit 1148 l. $\frac{326}{1288}$.

If 10 Brick-layers make a Wall of 100
Foot long, and 20 foot high in 12 Days,
how many Brick-layers will make a Wall
of 236 foot long, and 20 foot high in 16
Days ?

facit 17 Men $\frac{7}{8}$.

CHAP.

CHAP. XVII.

A most brief and compendious way of working all manner of Questions of Interest upon Interest.

Example.

First, State your Question thus :

If 100 l. gain 6 l. what the Principal?

2. Multiply the second and third Numbers together, and divide by your first, which is done by cutting off the two first Figures of the Pounds with a Line.

3. Multiply them by 20, by 12, and 4, and all above two Figures in each Multiplication carry over the Line to the left, as you see in these following Examples.

If 100 l. in 12 Months gain 6 l. what will 356 l. gain in 18 Months?

If 100 l. ——— 6 l. ——— 356 l.

	l.	s.	d.
12 Mon. fa.	21	07	2½
6 Mon. fa.	10	13	7
	32	00	9¼

	6
21	36
	20
7	20
	12
2	40
	4
1	60

275 l.

275 l. let out for three years, at 6 l. per Cent. per Annum.

100 ————— 6 ————— 275
6

l. s. d. 16 | 50
1 Year *facit* 16 — 10 — 0 Then 20
3

3 Years will be }
3 times this Sum } 10 | 00

236 l. 10 s. 5 d. let out for 16 Months,
at 6 l. per Cent. per Annum.

100 l. ————— 6 ————— 236 — 10 — 5
6

Mo. l. s. d. 14 | 19 — 02 — 6
facit in 12 : 14 — 3 — 9 $\frac{1}{2}$ 20
 $\frac{1}{3}$ 4 — 14 — 7 $\frac{1}{2}$

Mo. *facit* in 16 : 18 : 18 — 4 —

3 | 82

12

9 | 90

4

3 | 60

The

Chap. XVII. *Interest upon Interest.* 139

The same Order observe for Interest upon Interest ; only add the last Interest to the third Number of the last Question, and work as before in these Examples following.

417*l.* 11*s.* 8*d.* let out for four Years, at 6*l.* per Cent. per Annum, Interest upon Interest.

<i>l.</i>	<i>l.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
100	—	6	—	417 : 11 : 8
				6

25		05 : 10 : 0
		20

Facit 25*l.* 1*s.* 1*d.*

1		10
		12

1		20
		4

		80
--	--	----

Multiply second and third Numbers together, saying, 6 times 8 Pence is 48 Pence, which is 4 Shillings, set down 0 and carry 4 to the Shillings, saying, 6 times 11 is 66, and 4 that I carried is 70 Shillings ; set down the 10*s.* and carry 3 to the Pounds, saying, 6 times 7 is 42, and 3 that I carried is 45, set down 5, and

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and carry 4, saying, 6 times 1 is 6, and 4 that I carried is 10, set down 0 and carry 1, saying 6 times 4 is 24, and 1 that I carried is 25, which set down, and cut off the two first Figures of the Pounds, and multiply as before, and the Product will be according to the Examples, 25 *l.* 1 *s.* 1 *d.* simple Interest for the first Year, the which add to your former Principal 417 *l.* 11 *s.* 8 *d.* and it will make 442 *l.* 12 *s.* 9 *d.* Then state your Question again, saying,

If 100 l. — 6 l. — 442 — 12 — 9
 6

26 | 55-16-6
20

11 | 16
12

Sec. Year 26—II—I—2

1984

3192

Add this Interest unto the $442-12-09$
 and it will make $469-03-10\frac{1}{4}$

Then

Chap. XVII. *Interest upon Interest.* 141

Then state your Question again, and work as before, saying,

$$\begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 100 \text{ l.} \text{---} 6 \text{ l.} \text{---} 469 \text{---} 3 \text{---} 10 \frac{3}{4} \\ \hline \hline \end{array}$$

$$\begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \quad 28 \mid 15 \text{---} 3 \text{---} 4 \frac{1}{2} \\ \text{Third Year } 28 \text{---} 3 \text{---} 0 \frac{1}{4} \mid 20 \\ \hline \hline \end{array}$$

Which 28 l. 3 s. 0 d. $\frac{1}{4}$ add unto the 469 l. 3 s. 10 d. $\frac{3}{4}$, facit 497 l. 6 s. 11 d. Then state your Question again, and work as before, saying,

$$\begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 497 \text{---} 6 \text{---} 11 \\ \hline \hline \end{array}$$

$$\begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 100 \text{ l.} \text{---} 6 \text{ l.} \text{---} 497 \text{---} 6 \text{---} 11 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 29 \mid 84 \text{---} 1 \text{---} 6 \\ \hline 20 \\ \hline \hline \end{array}$$

Which being added to the 497 l. 6 s. 11 d. facit 527 l. 3 s. 8 d. $\frac{3}{4}$ Interest upon Interest for 4 Years at 6 l. per Cent. per Annum.

$$\begin{array}{r} 527 \text{---} 3 \text{---} 8 \\ \hline \hline \end{array}$$

And

142 *Interest upon Interest.* Chap. XVII.

And thus you may in a brief manner work all Questions of this nature. Other ways of working there are, of which I shall give you two or three Examples, and leave them to your Consideration.

Example.

I demand how much the Interest of 819 *l.* will amount unto for 3 Years, 7 Months, 18 Days, after 6 *l.* per Cent. per Annum, Interest upon Interest?

work
ays of
re you
em to

If 100 ————— 106 ————— 819

819 l.
ns, 18
terest

If 100 ————— 106 ————— 819
 20
16380
 12
196560
 106
1179360
1965600
20835360 first Year.
 106

1250118
2083530
220854(18 *second Year.*
106

1325124
2208540
234105(24 *third Year.*
106

1404630
 2341050
248151(30 fourth Year, from which sub-
234105
 (track the third.
14046 one Year.

7023 : 6 Months.
1170 : 1 Month.
585 : 15 Days.
117 : 3 Days.
4105 : third Year.

Facit 243000 d.

A Table

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A Table to find out what any Sum of Money will amount to for 21 Years, or under, at 6l. in the Hundred, Interest upon Interest.

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	
1	01	02	1	The Table is so plain,
2	02	05	2	that I suppose it needs
3	03	09	3	very little Demonstrati-
4	05	03	0	on; I shall therefore on-
5	06	09	0	ly give you one or two
6	08	04	1	Examples.
7	10	00	3	
8	11	01	2	As,
9	13	09	1	
10	15	09	3	If you would know
11	17	11	2	what 36 l. comes to In-
12	00	02	3	terest upon Interest for
13	02	07	3	20 Years.
14	05	02	2	Look against Number
15	07	11	0	20 in the first Column,
16	10	09	2	and you will find what
17	13	10	0	the Interest upon Interest
18	17	00	3	of 1 l. comes to for that
19	00	05	3	time. Then say, by the
20	04	01	2	Rule of Three.
21	07	11	2	

If 1 l. — 3 l. 4 s. 1 d. — 36 l. ?

If

32
708
444

VII.

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61.

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If

Ch. XVII. Interest upon Interest. 145

I desire to know how much 346 Pound will amount unto in 13 Years, Interest upon Interest, at 6 Pounds per Cent.

Look against Number 13 in the first Column, and you will find 2 l. 2 s. 7 d. 3 q.

Then say as before,

l. s. d. q.
If 1 be — 2 — 2 — 7 — 3 — 346 l.

20

42

12

511

4

2047 q.

346

12282

8188

6141

708262

32 2 (2 8968

708262 (17708 (5(2475|5

AAAAAA

122222

XXXX

737—15—5 1/2 fac.

H

A

A very brief and necessary Table to find out the present Worth of the Annuity or yearly Rent for 21 Years or under, after the Rate of six per Cent. per Annum.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	
1	0	18	10	2	For the understand-
2	1	16	08	0	ing of this Table, the
3	2	13	05	2	same Order is to be ob-
4	3	09	03	2	served with the former :
5	4	04	02	3	As for Example.
6	4	18	04	0	If you would know
7	5	11	07	3	what one Pound yearly
8	6	04	02	2	Rent is worth for 7
9	6	16	00	2	Years in ready Money.
10	7	07	02	2	Look against Num-
11	7	17	09	0	ber 7 in the first Co-
12	8	07	08	0	lumn, and you will find
13	8	17	00	2	what 1 Pound is worth
14	9	05	11	0	for seven Years, viz.
15	9	14	02	3	5—11—7 $\frac{1}{4}$
16	10	02	01	1	Now to know what
17	10	09	06	2	any other Annuity (as
18	10	16	06	1	40 <i>l.</i> &c.) is worth for
19	11	03	01	3	the same time, say by
20	11	09	04	3	the Rule of Three.
21	11	15	03	1	

If

l. s. d. q.
 If 1 l. be — 5 — 11 — 7 — 3 what 40 l.
facit 223 l. 5 s. 10 d.

I have a Shop, a Place, or an Office, &c.
 worth 60 l. *per Annum* for 21 Years, and
 would sell it for ready Money; the Question
 is, how much it is worth?

Look against Number 21, and you will
 find 1 l. a Year is worth for that time 11 l.
 15 s. 3 d. 1 q. Then say,

If 1 l. be worth 11 l. 15 s. 3 d. $\frac{1}{4}$ what
 shall 60 l. be?

facit 705 l. 16 s. 3 d.

What is 10 l. *per Annum* worth in ready
 Money for 4 Years and $\frac{1}{2}$ to come, at 6 l.
per Cent?

facit 38 l. 7 s. 7 d. $\frac{1}{4}$

First, see the Table what 1 l. is worth
 for 4 Years.

facit 3 l. 9 s. 3 d. $\frac{1}{2}$

Then say, if 1 l. be worth 3 l. 9 s. 3 d. $\frac{1}{2}$
 what shall 10 l.

facit 34 l. 12 s. 11 d.

H 2

Now

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Now to find what the $\frac{1}{2}$ Year is worth, see in the Table what 1 l. is worth for 5 Years.

facit 4 l. 4 s. 2 d. $\frac{3}{4}$.

'Then say, If 1 l. be — 4 l. 4 s. 2 d. 3 q. — 10.

From which subtract the 4th Year, 5 Years 42 l. 2 s. 3 d. $\frac{1}{2}$.
and the Remains will be for 1 Year, 4 Years. 34 l. 12 s. 11 d.
then take the $\frac{1}{2}$ of it, 1 Year. 7 l. 9 s. 4 d. $\frac{1}{2}$.
which will shew what the $\frac{1}{2}$ Year is worth. $\frac{1}{2}$ Year. 3 l. 14 s. 8 d. $\frac{1}{4}$.

facit 3 l. 14 s. 8 d. $\frac{1}{4}$.

Which added to the *Facit* of the fourth Year, and it maketh 38 l. 7 s. 7 d. $\frac{1}{4}$.

C H A P. XVIII.

The Rule of Fellowship without Time.

1. **I**N the working of this Rule there is no difference betwixt it and the Rule of Three, where every Man's particular Stock being added together, the Total must be the first Number in the Rule of Three, the Gains the second, and every Man's particular Stock the third.

The

up

Ch. XVIII. *The Rule of Fellowship.* 149

The Use of this Rule is therefore to give to each Partner his just and equal Share.

Observe then,

I. *As the whole Stock is to the whole Gain; so is every Man's particular Stock to every Man's particular Gain.*

Example.

Two Merchants company: *A* put in 20 *l.* *B* put in 40 *l.* and they gained 50 *l.* I demand each Man's Part of the Gains?

A ————— 20 *l.*

B ————— 40 *l.*

If 60 *l.* gain 50 *l.* what will 20 *l.*?

facit 16 *l.* 13 *s.* 4 *d.* *A.*

If 60 *l.* gain 50 *l.* what will 40 *l.*?

facit 33 *l.* 6 *s.* 8 *d.* *B.*

50 — 0 — 0

If both the Shares added together make up the whole Gains, then is the Work right.

H 3

Three

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Three Farmers hired a Shepherd to keep their Sheep for 7 *l.* 10 *s.* per Annum.

The first committed 430 Sheep to his care, the second 357, and the third 500 Sheep: I demand how much each Man must pay of this 7 *l.* 10 *s.*

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
A must pay	2	10	1	$\frac{513}{1287}$
B must pay	2	01	7	$\frac{387}{1287}$
C must pay	2	18	3	$\frac{387}{1287}$

Proof 7—10—0

Four Merchants ventur'd to Sea a Stock of 2475 *l.* whereof *A* put in 710 *l.* *B* put in 960 *l.* *C* put in 207 *l.* *D* put in 598 *l.* and they gained 2000 *l.* But Tempestuousness of Weather arising, were forced to cast overboard as many Goods as amounted to 769 *l.* I demand what each Man must bear of this Loss?

	<i>l.</i>	
A must bear	220	$\frac{1490}{2475}$
B ———	298	$\frac{690}{2475}$
C ———	64	$\frac{783}{2475}$
D ———	185	$\frac{1987}{2475}$

facit 769

Four

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769l.
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Four

Ch.XVIII. The Rule of Fellowship. 151

Four Grocers laid in a Stock containing these several Sums following : *A* put in 120 *l.* *B* put in 136 *l.* *C* put in 180 *l.* *D* put 210 *l.* and with it they bought a Parcel of Fruit, by which they gained 398 *l.* I demand each Man's Part of the Gains ?

	<i>l.</i>		
<i>Answer</i> {	<i>A</i> —	73 $\frac{602}{848}$	602
	<i>B</i> —	83 $\frac{510}{848}$	510
	<i>C</i> —	110 $\frac{580}{848}$	580
	<i>D</i> —	129 $\frac{246}{848}$	246
		<hr/>	
		398	1938 (3
			646

Three Merchants made a Company, *A* put in a certain Sum of Money, *B* put in as oftentimes 5 *l.* as *A* put in 4 *l.* *C* put in as oftentimes 7 *l.* as *B* put in 6 *l.* and they have gained together a certain Sum of Money, whereof *A*'s Part is 100 *l.* I demand *B* and *C*'s Part, and the whole Gains ?

$$\begin{array}{rcl}
 4 \text{ — } 100 \text{ — } 5 & \text{facit} & 125 \text{ } B. \\
 6 \text{ — } 125 \text{ — } 7 & \text{facit} & 145 \frac{1}{2} \text{ } C. \\
 & \text{facit} & 100 \text{ } A.
 \end{array}$$

H 4

370 $\frac{1}{2}$

Two

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Two Merchants made a Company, *A* put in 350*l.* and they gained together 196*l.* of which *B* must have so oftentimes 10*l.* as *A* must have 6*l.* I demand how much Money *B* put in the Company?

Always observe that every Man must have according as he hath put in: Then consider,

If 6 ————— 350 ————— 10?

facit 583 *l.* $\frac{1}{3}$ *B* put in.

Two Men company and make a Stock of 700*l.* whereof *A* put in 300*l.* and they gained together 240*l.* I demand what each Man must have of the Gains?

facit 102—17—01 $\frac{1}{2}$ *A.*

facit 137—02—10 $\frac{2}{7}$ *B.*

240—00—00

Three Merchants made a Company: *A* put in 600*l.* *B* put in so oftentimes 50*s.* as *A* put in 40*s.* *C* put in so oftentimes 70*s.* as *B* put in 60*s.* and they gained together

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together 500 l. I demand what each Man put in, and must have of the Gains ?

In Questions of this Nature, the particular Stocks unmentioned, must be found out by that which is mentioned.

As for Example, to find what Stock B put in.

$$\begin{array}{c} \text{l.} \\ \text{If } \text{---} 4 \text{---} 600 \text{---} 5? \\ \text{facit } 750 \text{ l. B.} \end{array}$$

Such Relation as 6 hath to the Money which B put in, such Relation must 7 have to the Money which C put in : As,

$$\begin{array}{c} \text{l.} \\ \text{If } \text{---} 6 \text{---} 750 \text{---} 7? \\ \text{facit } 875 \text{ l. C.} \end{array}$$

600 A.

750 B.

875 C.

2225

l.

1 { 2225 --- 500 --- 600 A.

2 { 2225 --- 500 --- 750 B.

3 { 2225 --- 500 --- 875 C.

2225

H 5

Three

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Three Merchants made a Company, *D* put in 437 *l.* *E* put in 211 *l.* and they have gained together 562 *l.* whereof *F* must have 187 *l.* 15 *s.* I demand *D* and *E*'s Part, and what *F* put into Company?

To find what *F* put in, first subtract his Particular from the whole Gain.

l.	s.
562	00
187	15
<hr/>	
374	05
<hr/>	

Then add *D* and *E*'s Stock together.

437 <i>D.</i>
211 <i>E.</i>
<hr/>
648

<i>Gain.</i>	<i>Stock.</i>	<i>Gain.</i>
374 <i>l.</i> 5 <i>s.</i>	648	187 <i>l.</i> 15 <i>s.</i>
		<i>facit</i> 325 <i>l.</i> ⁶¹⁵ / ₇₄₈₅

Then to find *D* and *E*'s Part of the Profit:

<i>Stock.</i>	l.	s.	<i>Stock.</i>
648	374	5	437 <i>D.</i>
648	374	5	211 <i>E.</i>

Fellow

Ch. XVIII. *The Rule of Fellowship.* 15

Fellowship with Time.

III. The Use of this Part is the same with the former, and differeth not in Operation save in this that every Mans Stock is multiplied by his time, and the Total of those Products added together is the first Number, the Gain or Loss the second Number, and every Man's particular Stock and time the third.

Observe then,

IV. *As the whole Stock and Time is to the whole Loss or Gain:*

So is every Man's particular Stock and Time to every Mans particular Loss or Gain?

Example.

Two Merchants company, D. put in 1000 for 4 Months, E. put in 136 l. for 3 Months and they gained 50 l. I demand each Man's part of the Gain?

	<i>l.</i>	<i>Mo.</i>	
D put in	100	4	400
E put in	136	3	408
			<hr/>
			808

808

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$$\begin{array}{r}
 \text{l.} \\
 808 \text{ --- } 50 \text{ l. --- } 400 \text{ facit } 24 \frac{608}{808} \\
 808 \text{ --- } 50 \text{ l. --- } 408 \text{ facit } 25 \frac{808}{808} \\
 \hline
 50
 \end{array}$$

Three Butchers hired a Piece of Ground for 12 *l.* 10 *s.* 6 *d.* A put in 20 Oxen 5 Days; B put in 16 Oxen 7 Days; C put in 25 Oxen 4 Days. I demand how much each Butcher ought to pay for his Proportion?

	Ox.	Days.	
A } put in	20	5	100
B }	16	7	112
C }	25	4	100
			<hr/> 312

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
312	12	10	6	100
				facit 4— 0—3 $\frac{6}{12}$
312	12	10	6	112
				facit 4— 9—11 $\frac{7}{12}$
312	11	10	6	100
				facit 4— 0—3 $\frac{6}{12}$

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	<i>l.</i>	<i>s.</i>	<i>d.</i>	
<i>A</i>	4	—	0	3 $\frac{6}{13}$
<i>B</i>	4	—	9	11 $\frac{1}{13}$
<i>C</i>	4	—	0	3 $\frac{6}{13}$
<hr/>				
<i>Proof</i>	12	—	10	— 6 $\frac{13}{13}$ (1
				$\frac{13}{13}$

Three Merchants company, *A* put in the first of *January*, 120 *l.* until *March* the 22^d. *B* put in 176 *l.* the 10th of *Feb.* until the 12th of *April*. *C* put in 295 *l.* the 2^d. of *Feb.* until the 25th of *April*, and they gained 800 *l.* I demand each Man's Part of the Gains?

l.
A must have 174 $\frac{7196}{44648}$

B must have 192 $\frac{26768}{44648}$

C must have 433 $\frac{30282}{44648}$

Proof 800

44648 (1
44648

Three

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Three Merchants company for 18 Months,
D put in 500 *l.* and at 5 Months took out
 200 *l.* and at 10 Months put in more 300 *l.*
 and at 14 Months took out 130 *l.* *E.* put in
 400 *l.* and at 3 Months put in more 270 *l.*
 and at 9 Months took out 100 *l.* and at 12
 Months put in more 100 *l.* and at 15 Months
 took out 99 *l.* *F.* put in 900 *l.* and at 6
 Months took out 200 *l.* and at 11 Months
 put in 500 *l.* and at 13 Months took out
 600 *l.* and they gained 200 *l.* I demand
 each Man's Part of the Gains?

	<i>l.</i>	
<i>D</i> must have	50	12350
<i>E</i> must have	62	32873
<i>F</i> must have	87	20447
		32873

Proof 200
 32873 (1
 32873

Two Men made a Stock of 165 *l.* where-
 with they gained 28 *l.* which added to the
 Stock makes 193 *l.* *D*'s Money was in 12
 Months, and *E*'s Money was in but 8 Mo.
 When they shared the Stock and Gain, *D*
 had 67 *l.* and *E.* 126. I demand what was
 each Man's Stock?

State

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State your Question thus:

As 12 mo. to 165 l. so is 8 mo. to 110 l.
for E's Stock, the which subtract from 165,
and the Remainder will be 55 l. for D's Stock.

The Proof.

If 55 l. in 12 mo. gain 12 l. what 110 l.
in 8 Months ? *Gains.*

55 l. ——— 12 l. ——— 110 l.	<i>facit</i>	E 16 l.	
mo. 12	8 mo.	<i>facit</i>	D 12 l.

Or,

Having the Stock, you have the Gains by
subtracting each Man's Stock from his Stock,
and Gain given, without the *Rule of Three*.

Stock and Gain of D. ——— 67 l.

Stock of D. ——— 55

D's Gain ——— 12

Stock and Gain of E. ——— 126

Stock of E. ——— 110

E's Gain ——— 16

So that D with 55 l. Stock gains 12 l. E
with 110 l. gains 16 l.

12

28

CHAP.

C H A P. XIX.

Of B A R T E R.

Barter is the exchanging Wares for Wares, or one Commodity for another.

Example.

Two Merchants barter : *A* hath 3 C. $\frac{1}{2}$ of Pepper at 13 *d.* $\frac{1}{2}$ per Pound ; *B* hath Ginger at 15 *d.* $\frac{1}{4}$ per Pound. I demand how much Ginger must be delivered for the Pepper ?

1. See what the Pepper is worth, saying,
If 1 lb. cost 13 *d.* $\frac{1}{2}$, what cost 3 C $\frac{1}{2}$?

facit 22 *l.* 1 *s.*

2. Say, if 15 *d.* $\frac{1}{4}$ buy 1 lb. of Ginger, what will 22 *l.* 1 *s.* buy?

facit 347 $\frac{1}{2}$ Ginger.

Two Men barter : *A* hath 20 Ells of Cloth at 9 *s.* 6 *d.* per Ell ready Money, but in Barter he will have 10 *s.* 2 *d.* per Ell : *B* hath *Fersey* Wool at 2 *s.* 10 *d.* per Pound : I demand how much Wooll must be delivered for the Cloth in Barter ?

As

As before, so here :

If 1 Ell in Barter be 10 s. 2 d. what 20 Ells in Barter ?

facit 2440 d.

If 34 d. buy 1 lb. what will 2440 d. buy ?

facit 71 lb. $\frac{1}{3}$

Two Drapers barter, the one hath 472 Yards of Canvas at 16 d. per Yard, the other lets him have 38 Pieces of Cloth : The Question is, How much one Cloth stands him in ?

facit 16 s. $\frac{1}{2}$.

20 Bags of Hops, each 3 C. $\frac{1}{2}$, bartered for 336 C. of Brazil, at 18 s. a C. I demand what Price were the Hops sold at ?

Answer 4 l. 6 s. $\frac{1}{3}$ per C.

A Merchant hath Tobacco, which he will barter at 14 d. per lb. for Sugar at 10 d. per Pound in Barter. I demand how much Tobacco must be given for 8900 lb. of Sugar ?

Answer 6357 lb. $\frac{1}{7}$.

Nutmegs

Nutmegs at 4 s. 2 d. per lb. ready Money, 5 s. in Barter, how must Pepper at 12 d. per lb. be sold to make the like Profit?

Answer 14 d. $\frac{2}{3}$

How many Dozen of Candles at 5 s. 2 d. per Dozen must be given for 3 C. 2 Qrs. 16 lb of Tallow at 37 s. 4 d. per C?

Answer 26 Dozen $\frac{3}{4}$

A Merchant hath Stockings at 39 s. per Dozen ready Money, which he will barter at 46 s. per Dozen for Canvas, at 13 d. $\frac{1}{2}$ per Ell ready Money. I demand what Price the Canvas must bear in Barter, to gain 5 l. in the 100 l.?

Answer 16 d. $\frac{1}{2}$ and $1\frac{17}{30}$ of $\frac{1}{2}$ d.

Broad Cloth of 6 s. 8 d. the Yard ready Money, is bartered for 7 s. 9 d. for Wool at 10 d. per lb. ready Money: What Price must be made of the Wool in Barter, to gain 11 l. per Cent.?

Answer 12 d. $\frac{723}{800}$

D hath Holland of 5 s. per Ell ready Money, bartered at 6 s. per Ell to E, for Broad-Cloth at 9 s. 6 d. per Yard, which cost
but

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but 8 s. I demand which gaineth most, and how much *per Cent.* ?

Answer. D gains 20 l. *per Cent.*
E 18 l. 15 s. *per Cent.*

CHAP. XX.

Of EQUATION.

THE Rule of *Equation* of Payments teacheth to reduce the times of several particular Payments to one time for the Payment of the whole Sum.

Example.

If the Question be of this Nature.

A Merchant oweth 500 l. to be paid at 3 Payments, *viz.* 300 l. at 4 Months, 100 l. at 6 Months, and 100 l. at 12 Months. The Debtor agrees to discharge the whole Debt at one Payment. Now the Question is, at what time the Payment ought to be made, without Damage unto the Debtor or Creditor,

tor, accounting 6 l. per Cent. per Annum Interest.

The Rule is this.

II. Multiply each particular Payment by its Time; then add all the Products together, and divide the Total by the whole Debt.

<i>l.</i>		<i>Mo.</i>	
300	multiplied by	4	<i>facit</i> 1200
100	multiplied by	6	<i>facit</i> 600
100	multiplied by	12	<i>facit</i> 1200
<hr/>		<hr/>	
<i>Divisor</i> 500		<i>Dividend</i> 3000	
3000 (6			
800			

So that the Answer to the Question (according to this Rule) is, that six Months is the Time for the Payment of the whole Sum.

III. For

III. *For the Proof of this Rule, thus :*

300 *l.* ought to be paid at 4 Months, and is not paid till 6 Months, that is 2 Months after its time. The Interest of 300 *l.* for 2 Months is 3 *l.*

Then 100 *l.* paid at 6 Months, is the Time equated.

The other 100 *l.* to be paid at 12 Months is paid 6 Months before its time ; and the Interest thereof for 6 Months, is likewise 3 Pound.

Which sheweth the Rule to be true, and at 6 Months is the time for the payment of the whole Sum, and thereby neither the Debtor nor Creditor is damaged according to the Law.

A Merchant oweth 450 *l.* to be paid at 3 payments, $\frac{1}{3}$ at 3 Months, $\frac{1}{3}$ at 5 Months, and $\frac{1}{3}$ at 8 Months, and the Debtor and Creditor agree, that the whole Sum shall be paid at one time : The Question is, what Time ought the whole Sum to be paid in ; so that neither the one nor the other may be damaged.

The Rule is to multiply each Part by its Time, thus :

$$\begin{array}{r} 3 \\ \hline \frac{1}{3} \text{ by } \frac{1}{3} \text{ facit } 1 \text{ Mon.} \end{array}$$

$$\begin{array}{r} 3 \\ 5 \\ \hline \frac{1}{3} \text{ by } \frac{1}{3} \text{ facit } 1 \text{ Mon. } \frac{2}{3}. \end{array}$$

$$\begin{array}{r} 3 \\ 8 \\ \hline \frac{1}{3} \text{ by } \frac{8}{3} \text{ facit } 2 \text{ Mon. } \frac{2}{3} \\ \hline 3 \\ \hline \text{facit } 5 \text{ Mon. } \frac{1}{3} \end{array}$$

A Merchant oweth 300 l. to be paid $\frac{1}{3}$ at Months, $\frac{1}{3}$ at 6 Months, and $\frac{1}{3}$ at 12 Mo. demand at what time the said Sum ought to be paid together ?

$$\begin{array}{r} 3 \text{ Mo.} \\ \hline \frac{1}{3} \text{ by } \frac{3}{1} \text{ facit } 1. \\ 3 \\ \hline 6 \end{array}$$

$$\frac{1}{3} \text{ by } \frac{6}{1} \text{ facit } 2.$$

$$\begin{array}{r} 3 \\ \hline 12 \end{array}$$

$$\frac{1}{3} \text{ by } \frac{12}{1} \text{ facit } 4.$$

$$\begin{array}{r} 3 \\ \hline \end{array}$$

facit 7 Mo. }

To prove the Certainty of this manner of Operation, you may take the same Course as before, 7 Months being the time for the Payment of the whole Sum.

See first what the Interest of the Money comes to, that should have been paid before the 7 Months ; and then see what the Interest of the Money comes to, that should have been paid after the 7 Months : And if the Interest of the one Part be equal with the Interest of the other, then is the former Operation right ; and 7 Months must needs be the just time. As for Example.

100 *l.* should have been paid at 3 Months, but now is not paid till 7 Months, so that

that the Interest for that 100 *l.* must be accounted for the 4 Months delay, which Interest is _____ 2 *l.* _____ 0 *s.*

100 *l.* more should have been paid at 6 Months, and now is delayed till 7 Months. The Interest for that is _____ 0 *l.* _____ 10 *s.*

facit 2 *l.* _____ 10 *s.*

The other 100 *l.* is paid 5 Months before its Time, and the Interest thereof for 5 Months is likewise _____ 2 *l.* _____ 10 *s.* equal with the former, which shews the Operation to be right.

There is owing to a Merchant 340 *l.* to be paid 80 Pound ready Money, 100 *l.* at 3 Months, and 160 *l.* at 8 Months, I demand what is the indifferent Time for the payment of the whole?

IV. In Questions of this nature, set down the particular Sums, and the several times of Payment, thus :

<i>l.</i>	<i>Mo.</i>
80 _____	00
100 _____	03
160 _____	08

Then multiply each Sum by its Time of Payment, and the Work will stand thus.
Add

Add all the Products together, and divide the Total by the whole Debt.

<i>l.</i>	<i>Mo.</i>
8	00
10	30
16	128
34	158

34 *Divisor.* 158 *Dividend.*

(2(2

158 $(4\frac{1}{2}$ *facit.*

34

There is 245 *l.* 10 *s.* 9 *d.* to be paid $\frac{1}{2}$ at 6 Months, $\frac{1}{3}$ at 8 Months, and the rest at 12 Months. What is the indifferent time for the Payment of the whole Sum together?

This Rule is laid down in the first and second Examples, Multiply each Part by its Time.

$\left. \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{6} \end{array} \right\} \text{by}$	$\left. \begin{array}{l} 6 \\ 8 \\ 12 \end{array} \right\} \text{facit}$	$\left. \begin{array}{l} 3 \\ 2\frac{2}{3} \\ 2 \end{array} \right\}$	The Certainty here- of is demonstrated by the Proof of the third Example.
--	--	---	--

facit Mo. 7 $\frac{2}{3}$

A is indebted unto *B* 300 *l.* to be paid 100 *l.* at 4 Months, and 200 at 8 Months.

I

And

And *B* oweth unto *A* 500 *l.* to be paid at 10 months. It is agreed between them, *A* shall make present pay of his whole Debt. and *B* shall pay his so much the sooner, as shall countervail that favour: I demand at what time *B* must pay the 500 *l.* reckoning simple Interest?

V. For the Resolution of this, and the like Questions, first see by the former Rule what time *A* ought to pay in his whole Money.

$$\begin{array}{rcl}
 & \text{Mo.} & \\
 1|00 \} & \text{at} & \left\{ \begin{array}{l} 4 \text{ — } 4 \\ 8 \text{ — } 16 \end{array} \right. \\
 2|00 & & \\
 \hline
 & & (2 \\
 & & 20. (6 \frac{2}{3} \\
 & & 3
 \end{array}$$

Then say by the Rule of Three.

$$\begin{array}{rcl}
 \text{If } 3 & \text{— } 6 \frac{2}{3} & \text{— } 5 \\
 & 20 (4 \text{ Mo. facit.} & \\
 & 8 &
 \end{array}$$

Which 4 Months is to be subtracted from 10 Months, (the Time that *B* ought to have paid in his Money) and there remaineth 6 Months.

Observe

Observe, For the Proof hereof, see first what the Interest of 300 *l.* comes to for 6 Months $\frac{2}{3}$.

Then see what the Interest of 500 *l.* comes to for 4 Months. If both the Sums be alike, then is the former Work true.

A Merchant hath a certain Sum of Money owing to him, to be paid at 7 Months; his Debtor doth agree to pay him half ready Money, and $\frac{1}{3}$ at 4 Months: I demand what time he must have to pay in the rest, so that neither Party may have Advantage of the other, without reckoning Interest upon Interest?

VI. For the Resolution whereof, it matters not what the Sum was; but you may work the same by any Number that will easily admit of the Parts mentioned in the Question. And for our present use, we will imagine the Sum that was to be paid at 7 Months, 60 *l.*

Whereof $\frac{1}{2}$, that is 30 *l.* must be paid content.

And $\frac{1}{3}$, which is 20 *l.* must be paid at 4 Months. Then see what the Interest of these two Parts comes to, for the time in which they were paid before they were due.

	<i>l.</i>		<i>Mo.</i>		<i>s.</i>
The Interest of	30	for	7	is	21
	20		3		06
					27

facit 27 s.

Now that which remains for a full Resolution of the Question, is only this :

To find out how long time the remaining Part of the Sum, which (is 10 *l.*) must be retained, that the Interest thereof may come to 27 s.

And that is done by the Rule of Three, thus,

The Interest of 10 *l.* for 1 Month is 1 s.

If 1 s. ——— 1 mo. ——— 27 s.

facit 27 Mo.

Unto which add the 7 Months }
 allowed at first ———— } 07

facit 34 Mo.

A Merchant hath owing him 500 *l.* to be paid him at 8 Months, and his Debtor doth agree to pay him 200 *l.* at 3 Months, on condition that he shall let him have the rest for so much the longer: The Question is, when he must pay the rest with Interest upon Interest?

As

As in the former Question, so in this.

First, see what the Interest of 200 *l.* comes to for 5 Months, paid before the time.

The Interest of 200 *l.* for 5 Months comes to 5 *l.*

Then by the Rule of Three see how many Months 300 *l.* must be let out, that so the Interest thereof may come to 5 *l.*

facit 3 $\frac{1}{3}$ Months.

To which add the 8

facit 11 $\frac{1}{3}$

A Merchant hath owing to him 146 *l.* 10 *s.* 9 *d.* to be paid $\frac{1}{3}$ content, $\frac{1}{4}$ at 3 Mon. $\frac{1}{2}$ at 5 Months, and the rest at 7 Months; and his Debtor doth agree to pay him all at one Payment: I demand when that Payment must be made, that neither have Advantage of the other?

	Mo.	Mo.
$\left. \begin{array}{l} \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{13}{20} \end{array} \right\}$	at	$\left\{ \begin{array}{l} 0 \text{ --- } 0 \\ 3 \text{ --- } 0 \frac{3}{4} \\ 5 \text{ --- } 1 \\ 7 \text{ --- } 1 \frac{31}{20} \end{array} \right.$
		<u> </u> <i>facit</i> 3 $\frac{4}{15}$

I 3

A

A Merchant hath owing 243 *l.* 19 *s.* 11 *d.* to be paid $\frac{1}{2}$ at 2 Months, $\frac{1}{3}$ at 3 Months, and the rest at 6 Months, the Debtor doth agree to pay $\frac{1}{2}$ content, and the other half at one Payment: I demand when the Payment must be made, that neither may be damaged?

First, do according to the former Rule, What is the indifferent time for the Payment of the whole Sum together?

	<i>Mo.</i>	<i>Mo.</i>
$\frac{1}{6}$ }	2	0 $\frac{1}{3}$
$\frac{1}{3}$ }	3	1
$\frac{1}{2}$ }	6	3
at	}	

facit 4 $\frac{1}{3}$ *Mo.*

Now in regard that $\frac{1}{2}$ is paid in 4 Months, and $\frac{1}{3}$ before it is due, it is Reason, and according to Rule, that he should have the other $\frac{1}{2}$ 4 Months $\frac{1}{2}$ longer, which being added to the just time of Payment.

facit 8 *Mo.* $\frac{1}{2}$

C H A P. XXI.

The Rule of REBATE or DISCOUNT.

1. **M**ERCHANTS commonly vend their Commodities either for ready Money, or to be paid at a certain time or times appointed, at 3, 4, 6, 12 Months, or the like: but it often happeneth to be very convenient both to the Buyer and Seller, that this Money be paid in before it be due.

A Merchant sells Goods to the Value of 100 *l.* to another, to be paid at 12 Months, but the other is willing upon an After-agreement to pay present Money upon Rebate, after 6 *l.* per Cent. per Annum, simple Interest. I demand the sum paid and rebated?

Observe, Before you lay down the manner of working, observe, that in all Rebate-ments, there ought to be no more Money paid than would augment it self to the Sum first due, if it were put forth to Interest, and this may also serve as a sure Proof of this Rule.

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How to state the Question.

1. First, see what the Interest of 100 l. cometh to for the time demanded.

2. Add that Interest to the 100 l. which must be the first Number in the Question, 100 l. the second, and the Sum to be rebated the third.

Example.

l. l. l.
If 106 — 100 — 100
100

(3

48(6

x0000 (94 $\frac{18}{33}$ facit.

x088

x0

10000

Which put forth
to Interest would
become 100 l.

I demand how much the Rebate of 289 l. 19 s. will amount unto for 6 Months, after 8 l. per Cent. per Annum, simple Interest?

l. s.
104 — 100 — 289 — 19
20

5799

100

579900

(1

$$\begin{array}{r}
 (1 \\
 78 \text{ (0} \\
 8992 \text{ (0} \\
 879900 \text{ (557/5} \\
 104444 \text{ —————} \\
 1000 \quad 278-15-\frac{25}{16} \\
 XX
 \end{array}$$

	l.	s.	d.
Was to be paid—	289	19	00
Is to be paid—	278	15	$\frac{25}{16}$

Is rebated— 11—03—

I demand the Rebate of 321 l. 18 s. for 11 Months after 6 l. per Cent. per Annum simple Interest?

To find the Interest of 100 l. for any Number of Months, you may take the Parts of 12 Months, as thus: If 6 l. be the Interest of 100 l. for 12 Months then 6 Months will be the $\frac{1}{2}$ of that; 3 Months the $\frac{1}{4}$ of that $\frac{1}{2}$; and 2 Months the $\frac{1}{3}$ of that for 6 Months.

Example.

Mo. l. s.

12—6—00

6—3—00

3—1—10

2—1—00

5—10

105 l. 10 s. — 100 l. — 321 l. 18 s.

facit 305 l. — $\frac{15}{16}$

15

1 de

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I demand the Discount of 378 l. for two 6 Months, after 6 l. per Cent. per Annum simple Interest?

By two 6 Months is understood that the $\frac{1}{2}$ of the Money is to be paid at 6 Months and the other $\frac{1}{2}$ at 6 Months after that.

l.	l.	l.
103	100	189
		facit 183 l. $\frac{51}{103}$
l.	l.	l.
106	100	189
		facit 178 l. $\frac{16}{33}$

I demand the Discount of 760 l. 16 s. for three 4 Months, after 6 Pound per Cent. per Annum simple Interest?

Mo.	l.	l.	s.
12	6	$\frac{1}{3}$ 760	16
4	2	253	12
8	4	253	12
12	6	253	12
102	100	253	12
facit 248 l. $\frac{32}{11}$ for the first Payment at 4 Months.			

104 l. — 100 — 253 l. 12 s.
facit 243 $\frac{1}{3}$ for the second Payment at 8 Mo.
 106 l. — 100 — 253 l. 12 s.
facit 239 l. $\frac{1}{3}$ for the third Payment at 12 Mo.

There are other ways for the working of Rebate; but I shall only instance one more, after 6 l. per Cent. As,

First, Multiply the Money and the Time.

Secondly, Divide that Product by 200 and the Time, and the Quotient is the Sum to be paid upon Rebate.

Example.

What is the Rebate of 100 l. for 12 Mo. after 6 l. per Cent. per Annum?

$$\begin{array}{r}
 100 \\
 12 \\
 \hline
 1200 \\
 (14 \\
 \times 2005 \quad \begin{array}{l} 140 \quad 70 \quad 35 \\ 212 \quad 106 \quad 53 \end{array} \\
 212
 \end{array}$$

100 was to be paid.

5 $\frac{3}{4}$ is to be rebated.

l. 94 $\frac{1}{4}$ is to be paid.

And thus you may work any other Question after 6 per Cent. &c.

But if the Rebate be after 8 l. per Cent. then let the Divisor be 150 and the Time

CHAP

C H A P. XXII.

Of E X C H A N G E.

1. **T**HE whole Course of Exchange is no more than to pay Money in one Place or Country, and receive in another the like Value or Sum, with Consideration of either Loss or Gain.

I might give you a Catalogue of Foreign Coins, but it will be to little purpose, because they are not currant Money as our *English* is, but do rise sometimes higher in Value, and sometimes lower, according as the Exchange runs. I shall therefore give you some choice Questions, and so leave you to enlarge as you see occasion.

A Merchant delivered 340 *l. Sterling* at *London* to receive the same at *Amsterdam*, the Exchange at 34 *s.* 7 *d.* *Flemish*, the 20 *s.* *Sterling*, I demand the same in *Flemish* Money.

2. Consider that first and third Numbers must be of one kind ; if the first be *Sterling* Money, the third must be so too : If the first *Flemish*, the third must be *Flemish*.

If

Chap. XXII. Of Exchange. 181

	<i>s. Sterl.</i>	<i>s. d. Flem.</i>	<i>l. Sterl.</i>
If 20	34	7	340
	12		20

415	6800
-----	------

332000

2490

282200|0

$\frac{1}{2}$ 141100 *d.*

$\frac{1}{2}$ 1175|8—4 *d.*

facit 587-18-4

Or thus:

340 *l.*—at 34 *s.* 7 *d.*

34

1360

1020

170

28—4 *d.*

1175|8-4 *d.*

587-18-4 *facit.*

A Merchant receiv'd a Bill of Exchange of 8000 Crowns at $5\text{ s. } \frac{1}{2}$ Sterl. I demand the Sum in Sterling Money. Say,

If 1 be — $5\text{ s. } \frac{1}{2}$, what — 8000?

facit 2285 l. 14 s. 3 d. $\frac{3}{4}$

A Merchant delivered 245 l. *Flem.* at *Middleborough* to receive the same at *London*, the Exchange at 29 s. and 5 d. *Flem.* the 20 s. *Sterl.* I demand the Sum Sterling Money?

If 29 s. 5 d. *Flem.* be 20 s. *Sterl.* what 245 l. *Flemish*?

facit 166 l. 11 s. $\frac{157}{353}$

A Merchant of *London* receiveth a Bill of Exchange from *Paris* 460 l. *Sterling*, for the Value delivered there at 84 d. *Sterling*, the 60 s. *Tournois*. I demand how much was delivered at *Paris Tournois*, when 20 s. make one Pound *Tournois*?

84 d. — 60 s. — 460 l.

facit 3942 l. 17 s. $\frac{1}{7}$ *Tournois*.

A Merchant at *London* delivered 80 l. *Sterling* by Exchange for *Frankfort* at 40 d. *Sterling* the Florin of 67 *Kreutzers*. The Question is, how many Florins of 63 *Kreutzers* the Florin, he must receive at *Frankfort*?

XXII.
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mand

Chap. XXII. Of Exchange. 183

3 d. $\frac{3}{4}$

$$\begin{array}{r} (4 \\ 67 \text{ (1 } \frac{4}{23} \\ 63 \\ 40 \text{ --- } 1 \frac{4}{23} \text{ --- } 80 \text{ l.} \end{array}$$

facit 510 $\frac{10}{23}$

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157
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A Merchant at *Dantzick* doth receive a Bill of Exchange from *London* 3999 Florins, and is for 376 l. Sterling delivered at *London*. I demand at what Price the Pound Sterling was delivered, when 30 gross Polish make a Florin ?

facit 319 $\frac{13}{23}$ gross Polish.

At *Antwerp* a Merchant receiveth a Bill of Exchange from *London* of 375 l. Flemish, for the Value received there at 27 s. 5 d. Flem. the 20 s. Sterling: I demand the Sum in Sterling Money that was delivered at *London* ?

facit 273 l. 11 s. $\frac{41}{33}$

A Merchant at *London* doth deliver 370 l. Sterling by Exchange from *Roan*, at 73 d. Sterling for 50 s. *Tournois*: The Demand is, How much he must receive at *Roan*, *Tournois* ?

facit 60821 s. $\frac{67}{73}$ *Tournois*.

A Spa-

A Spanish Merchant doth receive a Bill of Exchange from London of 700 Duckets, and is for 196 l. 15 s. delivered at London. I demand at what Price the Ducket was delivered?

facit 5 s. $\frac{37}{118}$.

III. How to know at what Rate we make the Exchange, transporting Money or Wares from one Country to another.

If a Ducket of Venice be worth 120 s. and at London 5 s. 7 d. at what Price is the Exchange made for the Ducket of 120 s. in transporting from Venice?

120 ——— 5 s. 7 d. ——— 112

facit 5 s. 2 d. $\frac{8}{17}$.

If a French Crown at Hamborough be worth 45 s. Lubish, and an Angel be worth 78 s. and at London a French Crown is worth 6 s. Sterling, and the Angel 11 s. Sterling. Whether is it better to bring Angels or French Crowns from Hamborough to London?

It is better to bring French Crowns by $\frac{27}{78}$.

If a Piece of Serge be worth 28 s. Sterling, and at Frankfort it is worth) all Charges

Chap. XXII. Of Exchange. 185

Charges abated) 17 Florins at 6 *Kreutzers* the Florin, at what Price do I make the Exchange for 66 *Kreutzers* in carrying Serges from *London* to *Frankfort*?

facit 1 s. $\frac{207}{273}$.

If a Mark at *Hamborough* be worth 33 s. *Lubish*, and at *London* 3 s. 7 d. at what Price is the Exchange made for 1 l. *Sterling*, in bringing Marks from *Hamborough* to *London*?

facit 184 s. $\frac{8}{43}$ *Lubish*.

If a *French Crown* be worth 7 s. $\frac{2}{3}$ *Flemish* at *Antwerp*, and 6 s. at *London*, at what Price do I make the Exchange for 1 l. *Sterling* in bringing *French Crowns* from *Antwerp* to *London*?

facit 25 s. $\frac{1}{3}$ *Flemish*.

If a Dollar at *Dantzick* be worth 39 *Gross*, and at *London* 4 s. 8 d. at what Price do I make the Exchange for 1 l. *Sterling*, transporting Dollars from thence to *London*?

facit 167 $\frac{8}{78}$ *Gross*.

CHAP.

CHAP. XXIII.

Of LOSS and GAIN.

I Need not go about to acquaint you with the meaning of this Rule, because the words themselves are sufficient to inform you, And for its Nature, I shall shew it you by many and various Questions, which indeed are something hard to apprehend, without the well minding of these four Principal Heads, which, being well understood, will carry you through the Difficulties thereof.

As,

First, To know what is gained or lost *per Cent.*

Secondly, To know how it shall be sold for to gain or lose so much *per Cent.*

Thirdly, Having gained or lost so much *per Cent.* to know what it cost.

Fourthly, There being so much gained *per Cent.* when sold for such a Rate: To know what is gained *per Cent.* when sold for more, or what is lost *per Cent.* when sold for less.

of

Of these in Order.

First, To know what is gained or lost per Cent. per Pound, per Ell, per Yard, &c.

Example.

If 1 lb. of Tobacco cost 18 d and is sold for 21 d. I demand how much is gained per Cent ? *First, see what the Gain or Loss is by Subtraction.*

21

18

3

Then let the Price it cost be the first Number in the Rule of Three, the Gain or Loss the second, and 100 l. the third.

If 18 gain — 3 l. — what 100 ?

facit 16 l. 13 s. 4 d.

If a Leather-seller buy a Parcel of Leather, for 2 s. 10 d. per Skin, and selleth the same again for 3 s. 2 d. what doth he gain per Cent.

s. d.

3 2 If 34 d. gain 4 d. what 100 l.

2 — — 10 *facit 11 l. 15 s. 3 d. 17*

0 — — 4

If

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If I buy an Ell of *Holland* for 6 s. 7 d. and sell it again for 5 s. 9 d. I demand how much the Loss is *per Cent.*?

$$\begin{array}{r}
 \text{s.} \qquad \text{d.} \\
 6 \text{ --- } 7 \\
 5 \text{ --- } 9 \\
 \hline
 \hline
 \end{array}$$

10

$$\text{If } 6 \text{ s. } 7 \text{ d. --- } 10 \text{ d. --- } 100 \text{ l.}$$

facit 12 l. 13 s. 1 d. $\frac{77}{78}$.

If 1 lb. cost 10 d. and is sold again for 8 d. the Question is, What is lost *per Cent.*?

If 10 d. lose --- 2 d. --- what 100 l.?

facit 20 l.

If a Piece of Cloth, containing 24 Yards, cost 42 s. and 1 Yard, is sold for 2 s. 8 d. the Question is, How much is gain'd or lost *per Cent.*?

gained 52 l. 7 s. 7 d. $\frac{3}{4}$ *per Cent.*

If a Piece of Silk containing 36 Yards, cost 9 l. and 1 Yard is sold for 9 s. 8 d. I demand whether I gain or lose, and how much *per Cent.*?

facit 93 l. 6 s. 8 d. *Gain.*

A Draper hath a Piece of Cloth containing 30 Yards, cost him 14 s. the Yard, and another Cloth containing 19 Yards, cost 7 s. the Yard, and he sells them one with another for 13 s. the Yard: I demand whether he

Chap. XXIII. *Loss and Gain.* 189

he doth gain or lose, and how much *per Cent.*

—1 $\frac{1}{2}$ *facit Gains per Yard.*

facit 15 l. 3 s. 9 d. $\frac{21}{25}$ *Gains per Ell.*

If 1 Yard cost 3 s. ready Money, and is sold again for 3 s. 4 d. for 8 Months: I demand how much is gained *per Cent. per Ann.* without Interest upon Interest?

facit 16 l. 13 s. 4 d. *Gains.*

If 1 Yard cost 9 s. ready Money, and is sold for 8 s. the Yard for 16 Months, the Question is, How much is lost *per Cent. per Annum*, without Loss upon Loss?

facit 11 l. 2 s. $\frac{2}{3}$ for 16 Months.

lost—8 l. 6 s. $\frac{1}{3}$ for 12 Months.

If I buy Cloth for 6 s. a Yard for 8 Mon. and sell the same again for 5 s. 6 d. ready Money, how much do I lose *per Cent. per Annum*?

Questions of this Nature are to be resolv'd at two Workings by the Rule of Three, thus:

If 6 s. lose ——— 6 d. ——— what 100 l.

facit 2000 d.

If 8 Mon. lose —2000 d.—what 12 Mon.

facit 12 l. 10 s.

If

If I buy Cottons for 3 s. a Yard for 5 Months, and sell them again for 3 s. 2 d. ready Money: The Question is, how much I Gain per Cent allowing 6 per Cent Interest?

First, See what they cost in ready Money.

Thus:

$$102 \text{ l.} \text{ --- } 10 \text{ s.} \text{ --- } 100 \text{ l.} \text{ --- } 3 \text{ s.} \\ \text{facit } 2 \text{ s. } 11 \text{ d. } \frac{5}{41}$$

$$2 \text{ s.} \text{ --- } 11 \text{ d. } \frac{5}{41} \text{ --- } 2 \text{ d. } \frac{63}{41} \text{ --- } 100 \text{ l.} \\ \text{facit } 8 \text{ l. } 3 \text{ s. } 10 \text{ d. } \frac{2}{3} \text{ Gain per Cent.}$$

A Grocer doth sell Cloves, for 4 s. per lb ready Money: The Question is, how long time he must demand, when he doth buy the same Cloves at 3 s. 8 d. the Pound, to Gain 13 l. per Cent. per Annum, without Gain upon Gain, at 6 per Cent. Interest.

First, See what the Gain is, if bought at 3 s. 8 d.

Thus:

$$3 \text{ s.} \text{ --- } 8 \text{ d.} \text{ --- } 4 \text{ s.} \text{ --- } 100 \text{ l.} \\ \text{facit } 109 \frac{1}{11}$$

Here is gained but 9 l. $\frac{1}{11}$, but he must gain 13 l. that is, 3 l. $\frac{10}{11}$ more, which must be gained by time: Therefore say,

$$\text{If } 6 \text{ l.} \text{ --- } 12 \text{ Mo.} \text{ --- } 3 \text{ l. } \frac{10}{11} \\ \text{facit } 7 \text{ Mo. } \frac{9}{11} \\ \text{A Lin-}$$

Chap. XXIII. *Loss and Gain.* 191

A Linnen Draper hath several sorts of Cloth, viz 470 Ells at 2 s. 10 d. per Ell ready Money, 730 Ells at 2 s. 6 d. per Ell ready Money, and 179 Ells at 3 s. 10 d. per Ell ready Money, and he sells the Ell one with another for 2 s. 2 d. to be paid $\frac{1}{2}$ at 5 Mon. $\frac{1}{4}$ at 6 Mon. and the rest at 9 Mon. Interest at 6 l. per Cent. I demand what is lost per Cent.

Ells		s.	d.		l.	s.	d.
470	} at {	2	10	} is {	66	11	08
730		2	6		91	05	00
179		3	10		34	06	02
<hr/>					<hr/>		
1379 Ells cost					192 02 10		
<hr/>					<hr/>		

1379 Ells sold at 2 s. 2 d. is 149 l. 7 s. 10 d.

Which Sum being to be received as above-said, will by Rebate at 6 l. per Cent. come to no more than 144 l. 17 s. 4 d. Then say

If 192 l. 2 s. 10 d. 100 l. 144 l. 17 s. 4 d.
facit 24 l. 12 s. per Cent. Loss.

The second Head.

To know how a Commodity must be sold to gain or lose so much per Cent.

Example.

If 1 lb of Nutmegs cost 9 s. 2 d. how much must it be sold for to gain 6 l. per Cent.

Let

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Let 100 l. be the first Number in the Rule of Three, the Price the second, and 100 l. with the Profit added, or the Loss subtracted, the third Number.

If 100 l. be 9 s. 2 d. price, what 106 l.
facit 9 s. 8 d. $\frac{3}{5}$

If a Barrel of Gun-powder cost 3 l. how must it be sold to lose 9 l. per Cent?

If 100 ——— 3 l. ——— what 91 l.
facit 2 l. 14 s. 7 d. $\frac{1}{5}$

If one Gallon of Sack cost 5 s. 10 d. for how much must it be sold to lose 8 l. per Cent.

If 100 l. ——— 05 s. — 10 d. ——— 92 l.

It must be sold for 5 s. 4 d. $\frac{2}{5}$

If 90 Ells of Cambrick cost 60 l. for how much must one Yard be sold to gain 8 l. per Cent.

It must be sold for 12 s. 7 d. $\frac{1}{5}$

If a Bag of Hops, weight 16. C. 1 qr. 12 lb cost 27 l. 6 s. 8 d. for how much must the C. weight be sold to lose 8 l. per Cent.

facit cost per C. 1 l. 13 s. 3 d. $\frac{11}{229}$

Sold to loss per C. 1 l. 10 s. 8 d. $\frac{1104}{1145}$

A Sugar Baker hath 736 lb of Sugar that cost 13 d. a Pound, and 137 lb 12 d. a Pound ;

I de-

Chap. XXIII. *Loss and Gain.* 193

I demand how he must sell the Pound one with another, to gain 9 l. per Cent. First see what one Pound cost. *facit* 12 d. $\frac{736}{873}$.

It must be sold for, to gain 9 l. per Cent.

1 s. 1 d. $\frac{21802}{21825}$.

If a Pound of Mace cost 8 s. how must it be sold to gain 24 l. per Cent.?

facit 9 s. $\frac{23}{25}$.

If 5 Yards cost 5 l. ready Money, for how long time must it be sold for 95 s. to lose 20 l. per Cent. without Loss upon Loss?

If I lay out 100 l. ready Money, and must receive but 95 l. there is 5 per Cent. Loss; but I must lose 20 l. per Cent. that is 15 l. more, so that I must sell my Goods, as if I sold that which cost me 100 l. for 80 l. Therefore see in what time 80 l. will amount to 95 l. at 6 per Cent. and that will answer the Question.

If 100 l. lose 6 l. in 12 Mo. in what time shall 95 l. lose 15 l.?

Or thus,

If 100 l. ——— 6 l. ——— 80 l.

facit 4 l. 16 s.

4 l. ——— 16 s. ——— 12 ——— 15 l.

K

If

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If 1 lb cost 23 d. ready Money, for how long time must it be sold for 25 d. to gain 11 l. per Cent. per Annum at 6 per Cent.?

Suppose I sell for 12 Months time, then I gain in the Price 8 l. $\frac{16}{23}$.

As thus :

$$\begin{array}{rcl} \text{If } 23 \text{ d.} & \text{---} & 100 \text{ l.} & \text{---} & 25 \text{ d.} \\ & & & & \text{facit } 108 \frac{16}{23}. \end{array}$$

But I must gain 11 l. that is, $2 \frac{7}{23}$ more ; therefore this must be gained by Time :

Thus :

$$\begin{array}{rcl} 6 \text{ l.} & \text{---} & 12 \text{ Mon.} & \text{---} & 2 \text{ l. } \frac{7}{23}. \\ & & & & \text{facit } 4 \text{ Mon. } \frac{84}{23}. \end{array}$$

This 4 Mon. $\frac{84}{23}$ must be subtracted from 12 Months, and the Remainder is the Answer to the Question.

$$\text{facit } 7 \text{ Mon. } \frac{14}{23}.$$

If 1 Yard cost 2 s. 9 d. ready Money, at what rate must it be sold for 3 Mon. $\frac{1}{2}$, to lose 8 l. per Cent.?

First, see what Rate it must be sold for in ready Money to lose 8 l. per Cent.

Thus :

$$\begin{array}{rcl} 100 \text{ l.} & \text{---} & 33 \text{ d.} & \text{---} & 92 \text{ l.} \\ & & & & \text{facit } 30 \text{ d. } \frac{9}{23}. \end{array}$$

If 30 d. $\frac{9}{23}$ be a ready Money Price, I must sell

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must sell it for no more, in regard I must stay
 3 Mon. $\frac{1}{2}$ for my Money: Therefore let 100^l.
 be your first Number, and 100 with the Inte-
 rest for 3 Mo. $\frac{1}{2}$ be the second Number, and
 the last *Facit* your third Number, thus:

$$100 \text{ --- } 101 \text{ l. } 15 \text{ s. --- } 30 \text{ d. } \frac{9}{12}.$$

$$\text{facit } 30 \text{ d. } \frac{8913}{100000}.$$

A Mercer buyeth Silk at 14 s. a Yard for
 7 Months; at what Rate must he sell it
 again for ready Money to gain 16 per Cent.
 without Gain upon Gain?

First, see what the Yard is worth in ready
 Money, thus:

$$103 \text{ l. --- } 10 \text{ s. --- } 100 \text{ l. --- } 14 \text{ s.}$$

$$\text{facit } 13 \text{ s. } \frac{109}{100}.$$

Then say, If 100 l. --- 13 s. $\frac{109}{100}$ — 116 l.

$$\text{facit } 15 \text{ s. } \frac{143}{100}.$$

The third Head.

*When there is gained or lost per Cent. to know
 what the Commodity cost.*

Example.

If 10 Yards of Cloth be sold for 16 s. per
 Yard, and there be 6 l. 10 s. Loss per Cent. the
 Question is, How much the 10 Yards cost?

First, subtract the Loss from the 100 l.

$$6 - 10$$

$$93 - 10$$

2. Let

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2. Let the Remainder of 100 *l.* when there is Loss; and the Gain added to 100 *l.* when there is Gain, be the first Number; let the Price be the second Number, and 100 *l.* the third.

If 93 *l.* 10 *s.* ——— 8 *l.* ——— 100 *l.*

facit 8 *l.* 11 *s.* $\frac{13}{100}$

If 20 Pound of Cloves be sold for 7 *s.* the Pound, and I Gain 9 *l.* per Cent. The Question is, How much the whole 20 *lb.* cost me?

$$\begin{array}{r} 20 \\ 7 \\ \hline 140 \\ \hline 7 \end{array}$$

109 *l.* ——— 7 *l.* ——— 100 *l.*

facit 6 *l.* $\frac{46}{100}$

If I sell 28 Ells of Cloth for 4 *s.* per Ell, and thereby lose 24 per Cent. I demand what the whole piece cost?

76 *l.* — 112 *s.* — 100 *l.* *facit* 7 *l.* 7 *s.* $\frac{13}{100}$

If 13 C. $\frac{1}{2}$ of Indico be sold for 36 *l.* and I gain 13 *l.* per Cent. I demand how much the C. weight cost?

113 — 36 — 100 *facit* 32 *l.* $\frac{14}{113}$

If 276 Fother of Lead, each 19 C $\frac{1}{2}$ be sold for 256 *l.* at 5 Mo. and I gain 11 per Cent.

per

Chap. XXII. *Loss and Gain.* 197

per Ann. The Question is, How much the whole cost ready Money ?

$$12\frac{1}{2} \text{ --- } 256 \text{ --- } 100 \quad \text{facit } 244\frac{196}{25}$$

The Fourth Head.

If by Wares sold at such a Rate there is so much gained or lost per Cent. how to know what would be gained or lost, if sold at another Rate.

Example.

If Cloth sold at 8 s. the Yard be 10 per Cent. Profit; what Gain or Loss per Cent. should I have had, if sold at 7 s. per Yard ?

In Questions of this Nature, let the first Price be the first Number, 100 l. with the Profit added or Loss subtracted, the second Number, and the other Price the third Number.

Example.

$$\text{If } 8 \text{ s. --- } 110 \text{ l. --- } 7 \quad \text{facit } 96 \text{ l. } \frac{1}{4}$$

lost per Cent. 3 l. } \frac{3}{4}

If one Gallon of Wine be sold for 9 s. and I lose 8 per Cent. how much shall I gain or lose when 3 Gallons are sold for 25 s. 10 d.

$$\text{If } 27 \text{ s. --- } 92 \text{ l. --- } 25 \text{ s. --- } 10 \text{ d.}$$

facit 11 l. } \frac{79}{81} \text{ per Cent. Loss.}

If 10 Yards be sold for 4 l. 10 s. and I lose 12 per Cent. what shall I gain or lose if I sell the same for 9 s. 9 d per Yard ?

$$9 \text{ s. --- } 88 \text{ l. --- } 9 \text{ s. } 9 \text{ d.}$$

facit 4 l. } \frac{1}{2} \text{ Loss per Cent.}

K 3

C H A P.

C H A P. XXIV.

Of ALLIGATION.

I. **A**LLigation is so named because it teacheth to knit or bind together divers Things of unequal Prices, whereby to find how much of each must be taken according to the Question propounded.

It is commonly divided into two Parts, viz.

Alligation Medial, and

Alligation Alternate.

II. *Alligation Medial* simple in it self, is no more than to discover or find out a common Medium, Rate, Price, or Proportion in the Mixture of divers Things together, which is perform'd by reducing the several Prices to one Denomination.

Then multiply the Quantity of each Parcel by its Price, and add all the Products together, the which Total divide by the Number of all the Parcels that are to be mixed, and the Quotient is the Answer to the Question demanded. For,

*As the whole Quantity is to the whole Price ;
so is 1 to its own Price.*

Ex-

XIV. Chap. XXIV. Of Alligation. 199

Example. A Meal-man hath several sorts of Meal of several Prices, and would mix them so, that the Quantity mixed might be one common Price, *viz*

$$\left. \begin{array}{l} 3 \\ 4 \\ 6 \end{array} \right\} \text{Bushels at } \left\{ \begin{array}{l} 3 \text{ s. } 5 \text{ d.} \\ 5 \text{ s. } 6 \text{ d.} \\ 4 \text{ s. } 8 \text{ d.} \end{array} \right\} \text{ a Bushel.}$$

Now the Question is, What one Bushel of this Mixture is worth?

Bush.	s.	d.	Bush.	s.	d.	Bush.	s.	d.
3 at 3—5			4 at 5—6			6 at 4—8		
3			5			4		
<hr/>			<hr/>			<hr/>		
9			20			24		
1			2			3		
0—3			<hr/>			1		
<hr/>			22 s.			<hr/>		
10 s. — 3 d.						28		
			l.	s.	d.	3 l. 0 s. 3 d.		
			13 — 3	0 — 3	1			

facit 4 s. 7 d. $\frac{8}{11}$ per Bushel.

A Hostler mixed Provender for Horses,

viz.

		s.	d.
5	Bushels of	$\left\{ \begin{array}{l} \text{Oats} \\ \text{Oats} \\ \text{Malt} \\ \text{Beans} \end{array} \right\}$	$\left\{ \begin{array}{l} 3-6 \\ 4-8 \\ 2-2 \\ 5-3 \end{array} \right\}$
3			
2			
4			

per Bush.

The Question is, What 1 Peck of this Mixture is worth?

K 4 Bush.

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bush. s. d. bush. s. d. bush. s. d. bush. s. d.
 5 at 3—6. 3 at 4—8. 2 at 2—2. 4 at 5—2.

Reduce each Quantity into Pecks, each Price into Pence, and multiply one by the other : Then say as before,

If 56 Pecks—682 *d.* 1 Peck *facit* 12 *d.* $\frac{5}{8}$

How to prove Alligation Medial.

Compare the total Value of the several Mixtures with the Value of the whole Mixture, and if they come both alike, the Work is true ; as in the former *Example* may appear.

		<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
5	} Bushels at	3	6	0	17	6
3		4	8	0	14	0
2		2	2	0	04	4
4		5	3	1	01	0
		<hr/>			<hr/>	
					2—16—10	

(1
 8 0
 682 (5|6
 x22
 x 2—16—10

An

Chap. XXIV. Of Alligation.

201

An Alehouse-keeper mixeth 3 Sorts of Ale together, viz. 15 Gall. at 4*d.* $\frac{1}{2}$ per Gall. 22 Gall. at 5*d.* per Gall. 20 Gall. at 6*d.* per Gall. The Question is, What one Gallon of this Mixture is worth? *facit* 5*d.* 0*q.* $\frac{50}{57}$.

A Refiner having 10*lb.* of Silver Bullion of 8 Ounces fine, 12*lb.* of 6 Ounces fine, and 11*lb.* of 9 Ounces fine, is desirous to melt all together, and to know of what Fineness a Pound weight of this Mass shall be?

<i>lb.</i>	<i>lb.</i>	<i>lb.</i>		
10	12	11	11	80.
8	6	9	12	72
			10	99.
80	72	99		
			33	251

33—251—I *facit* 7 oz. $\frac{20}{33}$ fine.

Or thus.

$$10 + 12 + 11 = 33$$

$$10 \times 8 = 80$$

$$12 \times 6 = 72$$

$$11 \times 9 = 99$$

Then say,

If 33—251—I

facit 7 oz. $\frac{20}{33}$ fine.

Note, That a + thus doth signify Addition, and two Lines thus, = Equality or Equation, but a x thus, Multiplication.

III. It will be necessary here to acquaint

K 5

you

quaint you, that as Silver is estimated 12 Ounces to the Pound, and 20 Penny weight to the Ounce; so an Ounce of Gold is divided into 24 Parts called Caracts: Now Refiners, Goldsmiths, and Mint-masters, do distinguish the different Fineness of either according as it endureth the Fire. As for Example: If an Ounce of Gold being tried, loseth 3 Caracts, it is estimated 21 Caracts fine, if it loseth 10 Penny-weight, it is esteemed 11 Ounces and 10 Penny-weight fine, &c.

A Goldsmith is to melt 9 lb 4 $\frac{3}{4}$ of Gold Bullion of 16 Caracts fine, with 7 lb 6 $\frac{3}{4}$ of 22 Caracts fine: The Question is, How many Caracts fine a Pound of this Mixture is worth?

Reduce them into $\frac{1}{2}$ Ounces, and work as before.

facit 18 Car. $\frac{11}{16}$ fine.

Or thus:

$$\begin{array}{r} 225 \times 16 = 3600 \quad 225 + 180 = 405 \\ 180 \times 22 = 3960 \end{array}$$

Then say,

If 405 — 7560 — 1 *facit 18 Car. $\frac{11}{16}$ fine.*

A Mint-master hath 60 lb weight of Gold
of

Chap. XXIV. Of Alligation. 203

of 23 Caracts fine, and 80 lb weight of 19 Caracts fine; the Question is, Whether there ought any Alloy to be mixed with it, to make a Pound of this Mixture to be 21 Caracts fine.

An Alloy is a Mixture of some baser Metal, as Copper, &c. to moderate the Fineness of it.

23	19	1380	60
60	80	1520	80
<hr/>			
1300	1520	2900	140
140	2900	I facit 20 $\frac{1}{2}$ Caracts fine; but it should be 21 Caracts fine.	

Wherefore I conclude this Mixture is not fine enough by $\frac{1}{2}$ of 20 Caracts fine; therefore no Alloy is to be used, but more Gold to be put in.

The Second Part of the Rule of Alligation.

1. The former Rule requir'd only a common Rate or Price from the whole of several Quantities mixed together; but this requires a Price and Quantity in general, composed of such Particulars as the Mixture is to be made of, and the Parts to be taken proportionably according to the Price, Quantity or Quality of each one.

Example.

A Tobacconist having several sorts of Tobaccos, as some at 2 s. a Pound, others at 3 s. a Pound, others at 6 s. a Pound, and the best at 7 s. a Pound, and is desirous to mix 112 Pound together, so that he might sell the whole Mixture for 4 s. a Pound ; the Question is, What Quantity of each must be taken to make up this Mixture ?

In order to the working of this Question, and others following.

First, set down the common Number, or Price propounded (towards the left-hand) which is 4 s. and likewise the Prices given, viz. 2 s. 3 s. 6 s. 7 s. thus orderly one under another, as you have learned in Addition.

$$\begin{array}{r} \left. \begin{array}{l} 2 \\ 3 \\ 6 \\ 7 \end{array} \right\} \\ 4 \end{array}$$

2. Observe what Sums are greater, and what are lesser than the common Number, and couple a greater and a lesser together, by making a Semicircle from one to the other ; for two greater or two lesser cannot be mixed together, because two lesser being thus taken, can never make so many as the com-

common Number, and two greater will be too many.



3. Having thus linked them observe what the Difference is between each of the greater Sums and the common Price, the which Difference is set directly against his Fellow which is linked with him.



Then likewise mark the Difference between the lesser Numbers and the common Number, and set each Difference thereof against that which is linked with it.



Lastly,

Lastly, Add all the Differences into one Sum, which ought to be the first Number in the Rule of Three ; and the whole Quantity to be mixed the second ; and each particular Difference the third.

$$\begin{array}{r}
 2 \text{ ----- } 3 \\
 3 \text{ ----- } 2 \\
 4 \text{ ----- } 1 \\
 6 \text{ ----- } 2 \\
 7 \text{ ----- } 2 \\
 \hline
 8
 \end{array}$$

Then work these according to the Rule of Three, and the fourth Number will declare the exact Proportion of the Mixture.

For, *As the whole Difference is to the whole Quantity ; so is each particular Difference to each particular mixed.*

$$\begin{array}{r}
 8-112-3 \\
 8-112-2 \\
 8-112-1 \\
 8-112-2
 \end{array}
 \left. \vphantom{\begin{array}{r} 8-112-3 \\ 8-112-2 \\ 8-112-1 \\ 8-112-2 \end{array}} \right\} \text{facit} \begin{array}{l} 42 \text{ of the first Sort.} \\ 28 \text{ of the second.} \\ 14 \text{ of the third.} \\ 28 \text{ of the fourth.} \end{array}$$

112

To prove this and the like Questions, multiply the whole Quantity mixed by the common Price, as here 112 by 4, *facit* 448.

2. Mul-

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2. Multiply all the particular Quantities found by its own Price, as 42 by 2, 28 by 3, &c. and if the Total of all the Products agree with the former Sum (448) your Work is well done.

A Vintner hath four sorts of Wine of several Prices, *viz.* some of 15 *d.* a Gallon, 17 *d.* a Gallon, 19 *d.* a Gallon, and 23 *d.* a Gallon; of which he is minded to mix the Quantity of 32 Gallons. The Question is, How many Gallons he must take of each Sort to make the Gallon worth but 18 *d.*

$$\begin{array}{r}
 15 \text{ ----- } 1 \\
 17 \text{ ----- } 5 \\
 19 \text{ ----- } 3 \\
 23 \text{ ----- } 1 \\
 \hline
 10
 \end{array}$$

$$\begin{array}{r}
 10 \text{ ----- } 32 \text{ ----- } 2 \\
 10 \text{ ----- } 32 \text{ ----- } 5 \\
 10 \text{ ----- } 32 \text{ ----- } 3 \\
 10 \text{ ----- } 32 \text{ ----- } 1 \\
 \hline
 \text{facit} \left\{ \begin{array}{l} 32 \\ 16 \\ 9\frac{1}{2} \\ 3\frac{1}{2} \end{array} \right. \text{ Gall.} \\
 \hline
 32
 \end{array}$$

A Druggist had 3 sorts of Drugs, one was valued at 4 s. the Pound, another sort at 7 s. the Pound, the third sort at 11 s. a Pound; out of these sorts he made two Parcels, either of them to be 30 Pound weight, whereof one of them thus mixed to be sold for 9 s. the Pound, and the other for 10 s. the Pound: How many Pound must be taken of either sort to make each Mixture?

The Price propounded in the first Proposition is 9 s. and in the other 10 s. Likewise the Prices given are 4 s. 7 s. and 11 s. But seeing two of these given Prices are lesser than the common Price, I cannot proceed to the former Example: Therefore I couple the two lesser with the greater, and their Differences I set against the greater, and the Differences of the greater against the two lesser: Then work as before. For,

As 11 the whole Difference, is to 30 the whole Quantity; so is 2 the first Difference, unto 5 and $\frac{1}{2}$ for its Quantity.

Proposition I.

Proposition II.

$$\begin{array}{rcl}
 & + & \dots\dots\dots 2 \\
 9 \left\{ \begin{array}{l} 7 \\ 11 \end{array} \right. & \dots\dots\dots & 2 \\
 & \dots\dots\dots & 58 \& 2
 \end{array}
 \quad
 \begin{array}{rcl}
 (11) & \dots\dots\dots & 6-3 \\
 10 \left\{ \begin{array}{l} 7 \\ 4 \end{array} \right. & \dots\dots\dots & 1 \\
 & \dots\dots\dots & 1
 \end{array}$$

I I		I I	
II—30—2	fa. 5 $\frac{5}{11}$	II—30—9	fa. 24 $\frac{6}{11}$
II—30—2	fa. 5 $\frac{5}{11}$	II—30—1	fa. 2 $\frac{1}{11}$
II—30—7	fa. 19 $\frac{1}{11}$	II—30—1	fa. 2 $\frac{1}{11}$

30 30

Barley at 7 Groats the Bushel, Wheat at 11 Groats the Bushel, Rye at 5 Groats the Bushel, and Oats at 10 Groats the Bushel, are so to be mixed, as 100 Bushels of the Mixture may be sold for 8 Groats the Bushel: The Question is, How much must be taken of each sort ?

$$\begin{array}{rcl}
 & & \dots\dots\dots 2 \\
 8 \left\{ \begin{array}{l} 7 \\ 11 \\ 5 \\ 10 \end{array} \right. & \dots\dots\dots & 2 \\
 & \dots\dots\dots & 1 \\
 & \dots\dots\dots & 3
 \end{array}$$

9—100—3	}	<i>facit</i>	{	33 $\frac{1}{3}$	Barley.
9—100—2				22 $\frac{2}{3}$	Wheat.
9—100—1				11 $\frac{1}{3}$	Rye.
9—100—3				33 $\frac{1}{3}$	Oats.

100

How

How much Alloy must I mix with Bullion of 11 Ounces $\frac{1}{2}$ fine, to abase the Bullion to 6 Ounces $\frac{1}{2}$ fine.

$$\begin{array}{rcl} \text{Ounces} & \{ & \text{Ounces} \\ 6\frac{1}{2} & \{ & 11\frac{1}{2} \\ & \{ & 0 \end{array} \left. \vphantom{\begin{array}{rcl} \text{Ounces} & \{ & \text{Ounces} \\ 6\frac{1}{2} & \{ & 11\frac{1}{2} \\ & \{ & 0 \end{array}} \right\} \begin{array}{l} 6\frac{1}{2} \\ 5\frac{1}{3} \end{array}$$

By this Alligation there must be taken 5 Ounces and $\frac{1}{3}$ of Alloy, to mix with the 6 oz. $\frac{1}{2}$ of Bullion.

A Goldsmith hath 4 Sorts of Gold, one finer than another, whereof one is 18 Caracts fine, another 20, another 16, and the fourth 22 Caracts fine: All these he would mix with such an Alloy, as that the whole Mixture of 150 oz. should be 15 Caracts fine: The Question is, How much must be taken of each Sort?

To answer this, and others of this Nature, set down, as before, the Rate demanded at the left-hand, and the Particulars under one another, and subscribe a Cypher under all (for the Alloy unknown) to set the Alloy's Difference, which is 15, against all the other Sums, according to the Example. Then work as before, saying, *As 76, the whole Difference, is to 150, the whole Quantity; so is each particular Difference to the Quantity sought.*

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18	---	15	15
20	---	15	15
25	---	15	15
16	---	15	15
22	---	15	16
	---	5	—
5 : 1 : 7			76

76	—	150	—	15	} <i>facit</i> }	29	²³ ₃
76	—	150	—	15		29	²³ ₃
76	—	150	—	15		29	²³ ₃
76	—	150	—	15		29	²³ ₃
76	—	150	—	15		29	²³ ₃
76	—	150	—	16		31	²³ ₃
						<hr/>	
						150	

A Refiner hath several Sorts of Bullion, *viz.* 30 lb of 6 oz. fine, 6 of 8 oz. fine, 12 lb of 9 oz. fine ; and he would so mix them together, that a Pound thereof should bear 6 Ounces fine. The Demand is, Whether any Alloy ought to be mixed with it, and how much ?

First, See by Alligation Medial what Fineness an Ounce of this Mixture will bear when mixed together, then work as in the last Question save one.

180

			180	30
30	16	12	128	16
6	8	9	108	12
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
180	128	108	416	58
		(1		
		(0		
		416(7 oz. $\frac{1}{2}$		
		58		

Therefore it is manifest that Alloy must be mixed to Alloy from 7 oz. $\frac{1}{2}$ to 6 oz. which is to be done thus; and you will find for every 6 Ounces of Bullion he must take 1 oz. $\frac{1}{2}$ of Alloy to mix with it.

$$\begin{array}{r}
 6 \left\{ \begin{array}{l} 7 \frac{1}{2} \\ 6 \end{array} \right. \\
 \quad \quad \quad 0 \quad \quad \quad 1 \frac{1}{2} \\
 \quad \quad \quad \hline
 \quad \quad \quad 7 \frac{1}{2}
 \end{array}$$

CHAP. XXV.

Of Instructions for the Measuring of any Superficies, Board, Glafs, Hangings, Pavements, &c.

I. **O**bserve, That Board and Glafs are usually measured by the Foot, and the Foot containeth 144 Inches.

There

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There is a Table 24 Foot in length, and 3 Foot wide. I demand how many Foot is contained therein?

The Rule is,

Multiply the Length by the Breadth, and the Product gives the Content of the whole.

24

3

facit 72 Foot.

There is a Table of 20 Foot 9 Inches long, and 3 Foot 8 Inches broad; how many Foot doth it contain?

Reduce them into Inches, and multiply as before.

facit 76 Foot $\frac{1}{2}$

How to measure Glas.

There is a House hath 26 Panes of Glass in the Window, each Pane being 2 Foot 3 Inches long, and 18 Inches wide: The Question is, How many Foot of Glass is contained in all?

facit 87 Foot $\frac{3}{4}$.

Pavements and Hangings are usually measured by the Yard.

One Yard in Length is 3 Foot.

One Yard square upon the Superficies is 9 Foot.

How

How to measure Pavements.

There is a Piece of Ground to be paved, containing 49 Yards in length, and 31 Yards in breadth; how many Yards is contained therein?

facit 1519 Yards.

A Gentleman had his Door paved, being 37 Yards 2 Foot one way, and 7 Yards 1 Foot the other way: I demand how many Yards are there in all?

facit 276 Yards $\frac{2}{3}$.

A Sute of Hangings 45 Yards $\frac{1}{2}$ long, and 2 Yard $\frac{1}{4}$ broad; how many Yards are there in all?

Divide by 16, because 16 Quarters is 1 Yard square.

facit 102 Yards $\frac{1}{8}$.

*Instructions for the measuring of Solids,
as Timber and Stone, &c.*

12 Inches is 1 Foot in length.

144 Inches is 1 Foot square Superficies.

172 Inches is 1 Foot solid.

There is a Stone of 4 Foot long, 3 Foot broad, and 2 Foot deep; I demand how many square Foot is contained therein?

The

The Rule is,

Multiply the three Dimensions one into another, and the Product is the Answer.

facit 24 Foot.

A Stone of 5 Foot, nine Inches long, 4 Foot 7 Inches broad, 2 Foot 8 Inches deep; I demand how many Foot there is contained in the said Stone?

Reduce all the Dimensions into Inches, and divide by 1728.

facit 70 Foot $\frac{1}{8}$.

How to measure Timber.

A Piece of Timber 20 Foot 8 Inches in length, 2 Foot 5 Inches broad, and 2 Foot thick; how many Foot doth it contain?

facit 99 Foot $\frac{8}{9}$.

A Country-man borrow'd of his Neighbour a Stack of Hay, the Content whereof was 40 Foot square: — When the time of Payment came, he told his Neighbour, he could not pay him altogether, but he would pay him 20 Foot square at that time, and 20 Foot square more at another time afterwards, which he performed. The Question is, Whether he paid the whole Quantity borrowed, or what was wanting thereof?

40	20
40	20
<hr/>	<hr/>
1600	400
40	20
<hr/>	<hr/>
64000 <i>borrowed.</i>	8000
<hr/>	8000
	<hr/>
	16000 <i>paid.</i>
	<hr/>

So that he paid but one Quarter of the Quantity he borrowed.

There are many things of this Nature, that might be brought in under these two heads, which are more difficult, as the measuring of Land of several Forms, and the Measuring of Timber, Stone, or other things not equally squared; the well managing thereof would require a Treatise of it self, which I omit, in regard it doth not so much concern my Practice, nor my Intention in this Tract; but I judge this sufficient for the present.

Laus Deo.

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Thos. Woodcock Borne in 4th year

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